Career Outcomes in a Matched Sample of Men and Women Ph.D.s

An Analytical Report

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PREFACE

he status of women scientists and engineers has been the subject
 previous reports by the Committee on the Education and Employ-
f Women in Science and Engineering, one focused on academe and
econd on industry and government. Both of these studies yielded
ngly similar conclusions, outlining a broad pattern of multiple
antages for doctoral women scientists and engineers in all fields
l employment sectors. Generally speaking, women were far more
 than men to be involuntarily unemployed and underemployed; they
uch less likely than men to attain senior faculty rank or move to
ment levels, and their earnings not only reflected these differ-
but were persistently lower even at equal ranks. Women who
red equal to men in all respects at receipt of the doctorate had
ssured careers than men, with slower progress and lower ceilings.

ecause such differences might arise for many reasons unrelated
crimination--among them, for example, women's presumed larger
ment of time and energy in marriage and parenting, and their
ed restricted geographic mobility--the Committee proceeded with
resent study, which examines in greater detail the career
rences of closely matched samples of men and women doctorates in
thematical and natural sciences, the social and behavioral
es, and the humanities. The latter fields are included for the
time; employment data on humanists were not available at the
f our earlier studies.

ne important factor that had to be omitted from the comparisons
 study is quality. The near impossibility of constructing truly
ive measures of an individual's quality has been of concern in
ther studies besides those that focus on gender differences. The
t approaches to objective assessments of quality employ various
measures such as grade point averages, test scores, rapid comple-
f a doctora e earning a doctorate in a highly-ranked (by

in average quality although women have an edge in academic ability as measured by college grades and high school test scores."[1] The problem of assessing relative research productivity and quality of men and women scientists proved more complex, however. Prior studies reported in the literature had yielded variable and even contradictory results, and the Committee stated that it had not found any studies that control for "access to appropriate research facilities, division of time between undergraduate and graduate teaching responsibilities, and especially availability of graduate and other research assistants."[2] After reviewing evidence that high publication rates do not necessarily translate into successful careers for women scientists as they do for men, and that "token" status in a department may depress productivity, the Committee concluded that "until an occasional major research department can assemble at least a critical mass of women faculty . . we do not believe studies of comparative performance will have much validity."[3]

Since then, additional information has become available which suggests strongly that publication and citation counts as measures of productivity and quality, respectively, must be applied with more than ordinary caution in the special case of sex comparisons. This information concerns the enormous increases in the submission/acceptance ratios of papers authored by women when prepublication reviews were conducted with authors' names deleted; an anonymous review policy was first instituted for papers submitted for presentation at annual meetings of the Modern Language Association, and soon extended by the Board of Directors to all MLA publications because the increase in the ratio to a value proportionate to women's representation in the relevant fields was considered as clear evidence of prior sex discrimination.[4] The concerns raised by these facts clearly apply with particular emphasis to the population of the present study, which includes humanists; given the field distribution of women in the humanities, a large majority of them are likely to be in modern language areas and to be significantly affected.

For a host of what are viewed as compelling reasons, it is customary for referees of scientific papers to know the identity of

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[1] *Climbing the Academic Ladder: Doctoral Women Scientists in Academe,* National Research Council, 1979, p. 38.

[2] Ibid., p. 87.

processes in the scientific community. There can be little question that events in the MLA experience cast some doubt on the absolute validity of prepublication review practices in the sciences as well, and hence on those quality judgments that are based in whole or in part on publication and citation data. As a first step toward ascertaining whether there is indeed reason to be concerned about sex fairness in prepublication reviews of scientific papers, it would be useful to gather data on submission/acceptance ratios by sex for paper in several scientific fields and for selected high-quality journals in those fields.

Despite all these considerations and because the matching characteristics of our sample suggested that comparisons of publication and citation counts might have some validity for this specific sample, such a study was attempted. Unfortunately, as described in Chapter 6, it proved impossible to carry out.

The elements of quality which the present study cannot address ma be precisely the ones on which the judgments that determine an individual's career path are based. This report and its predecessors demonstrate clearly that objective factors alone cannot account adequately for the career differences which exist between male and female Ph.D.s. It does not follow, however, that "quality" difference will do so; that would be true only if it can be shown that quality judgments are free of gender bias.

The Committee expresses its sincere appreciation to the authors, Nancy C. Ahern and Elizabeth L. Scott, for their work on this project.

The study was originally conceived and designed by Dorothy M. Gilford while she was director of human resource studies in the Commission on Human Resources. We take this opportunity to acknowledg not only her instrumental role in this project, but the many other occasions on which she assisted the Committee on the Education and Employment of Women in Science and Engineering during her tenure with the Commission. We also thank William C. Kelly, Executive Director of the Commission on Human Resources, for valuable administrative guidance, and Commission reviewers Lloyd Humphreys and Nancy Milburn for their helpful comments.

Special thanks also go to the National Science Foundation for their support of this study and in particular to Morris Cobern who as

well paid.

We have called attention to the considerable field d
we find in these factors, and the present study again val
conclusion that sex disparities vary significantly by aca
pline. This finding is particularly interesting because
forcefully that the disadvantages women suffer have littl
marriage, family responsibilities, or limited geographic
traditional and widely accepted explanations for women's
tory career progress--for if they did, there should be no
differences among fields. The conclusion that many disac
from the traditions of the disciplines themselves (as in
for example, where some of the most striking disparities
inescapable.

The study provides clear evidence that one factor pa
responsible in the past for slowing women's careers is no
applicable: women in the recent Ph.D. cohorts are not si
more likely than men to interrupt their careers. They mu
counted among the permanently attached members of the wor

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Lilli S. Hornig
Chair,
Committee on the Educa
  Employment of Women
  and Engineering

CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This study was designed to analyze the career outcomes of men and women Ph.D.s. It is based on a sample survey of approximately 50,000 Ph.D. scientists, engineers and humanists conducted in 1979 by the National Research Council. The Survey of Doctorate Recipients has bee conducted biennially since 1973 with support from the National Science Foundation, National Endowment for the Humanities, and National Institutes of Health. It is based on a sample drawn from a virtually complete file of individuals receiving doctorates from U.S. institutions during the period 1936-1978. The sample is carefully stratified by sex, field, and other variables so that the individual survey responses can be weighted to estimate population totals and population characteristics.

Many studies indicate a striking contrast in the career outcomes of men and women. However, most analyses sample men and women in a specified employment situation, for example, university and college faculty. Part of the observed differences will be due to the tendency for the women to be younger and their tendency to be less highly educated. On the other hand, women who have not obtained this particu lar kind of employment or who have been terminated will not appear in the sample. That is, these studies can investigate only those women who have, in a certain sense, already achieved success.

The present study is based on triads consisting of one woman and two men who are matched as nearly as possible according to selected background characteristics such as educational criteria and years of experience. Information on these triads allows us to compare the 1979 employment patterns of a set of men and women Ph.D.s with similar trai The study provides data on sex-related barriers to the advancement of women in each major field for cohorts of triads who obtained a doc torate beginning in the 1940s and continuing through the two periods

We are indebted to Dorothy M. Gilford who designed part of a larger project of the Commission on Human Resou Research Council.

This study is based on 5,164 triads of one woman and two men who
earned doctorates in the period since 1940 and who responded to a
1979 National Research Council survey. Each woman is matched with
two men according to year of doctorate, field of doctorate, reputa-
tion of the Ph.D.-granting department, and race. For some analyses,
the members of the triads are further matched by number of years of
full-time equivalent experience and by current employment sector.

mployment

As many as 87 percent of the women and 94 percent of the men in the
sample who received doctorates in the 1940s and 1950s were in the
work force in 1979 (page 15).

The women who earned Ph.D.s in the early 1970s had a median age of
37 at the time of the survey. About two-thirds of them were married
but less than half had children. Very few--only one in ten--of the
women with children were not in the work force in 1979 (page 30).

There is no evidence of "reverse discrimination" in obtaining
employment in any cohort. Even for the most recent 1975-1978 Ph.D.s
involuntary unemployment was two and a half times higher for women
than for men (pages 42-43).

ank and Promotion

Among the academically employed Ph.D.s who were surveyed 20 or more
years past the doctorate, 87 percent of the men were full professors
compared with 64 percent of the women (page 18).

The sex differentials in faculty status 10-19 years past the Ph.D.
are large and pervasive. For a given pair of one woman and one man
with matched characteristics, the man is 50 percent more likely than
the woman to have been promoted to full professor (page 25).

Sex differences in tenure status, after controlling for rank, are
significant in certain fields, with the largest discrepancy occurrin
in the biosciences. Of course, tenure status and rank are highly
correlated (pages 17 and 26).

Women faculty were more likely than men to have changed emp
between 1975 and 1979--28 percent compared with 19 percent

- For the female Ph.D.s who were generally in their late thir
  (i.e., those surveyed 5-9 years past the doctorate), marrie
  with children were just as likely as unmarried women with n
  children to have senior faculty rank (page 37).

- Overall, women with Ph.D.s since 1975 show a lower rate of
  appointments than matching men. This is highly variable by
  in psychology, women have a slightly more favorable distribu
  by faculty rank, whereas in biosciences and the humanities,
  male Ph.D.s have fared better (page 45).

- Twenty-five percent of the recent female Ph.D.s hold academ
  positions that are non-tenure track. The rate for matching
  is 15 percent (page 46).

Salary

- Academic women with Ph.D.s prior to 1960 reported earnings
  $3,800 or 11 percent less than those for matching men. Amor
  professors of chemistry, the sex difference was $5,500 for
  matched pair sample--only a slight reduction from the previo
  reported $6,200 gap where no matching is made (page 17).

- Female salaries at major research universities are significa
  below the estimated salaries for men with similar character
  The estimations take account of a number of work-related var
  such as full-time status, primary activity, and type of inst
  of employment, but do not include measures of research produ
  (page 54).

- Salary differences between young male and female Ph.D.s in a
  still exist, even after controlling for type and quality of
  training. The largest differentials in pay for the post-197
  were found in chemistry ($3,300) and the biological sciences
  ($2,100) (page 48).

CHARACTERISTICS OF MEN AND WOMEN DOCTORATES

Before comparing the employment profiles of men and women in the matched-pair sample, we will consider the general demographic characteristics of the Ph.D. population and the sex differences based on an unmatched sample.

Doctorates awarded to women

The number of doctoral degrees awarded from U.S. institutions remained fairly steady through the 1950s, began rising sharply from about 1961 through 1971, and has leveled off or dropped somewhat following the peak years of 1971-1972 (Table 1.1). For women in particular, a sharp increase in numbers of Ph.D. recipients occurred during the 1960s but the largest increases have taken place since 197 In the social sciences, for example, (including sociology, economics, political science, and other fields) the number of Ph.D.s awarded annually to women increased from just over 1,000 to nearly 2,000 during the recent eight-year period. Despite the growth in the last decade, the supply of women doctorates in most physical sciences, mathematics, and engineering fields remains relatively low.

Women's share of all earned doctorates was lowest in the 1950s, which witnessed a postwar baby boom and the return to colleges and universities of a large number of servicemen, many of whom took advantage of the G.I. bill to support their graduate education. Since 197 the percent of women among Ph.D. recipients has increased significant in mathematics, from 8 percent of all doctorates to 14 percent; in bioscience, from 14 percent to 24 percent; and in psychology from les than 22 percent to nearly 38 percent (Table 1.2). The sharpest rate of increase was in engineering, although the number of women receivin engineering Ph.D.s was and still is very small (only 30 U.S. citizens

Year	& engr	sciences	sciences	ities	& engr	sciences	sciences	
1940	1,185	520	254	367	19	71	42	
1941	987	464	352	376	19	42	59	
1942	914	617	208	116	44	100	83	
1943	920	445	132	269	45	22	81	
1944	541	246	4	133	19	89	71	
1945	294	169	61	93	13	55	64	
1946	358	213	187	49	40	68	57	
1947	948	374	314	581	43	62	60	
1948	1,177	388	357	317	46	74	61	
1949	1,912	878	622	510	66	91	96	
1950	1,824	839	634	766	41	60	85	
1951	1,892	1,012	937	636	59	140	88	
1952	2,208	1,103	1,120	746	55	110	102	
1953	2,043	1,213	1,083	997	80	142	95	
1954	2,391	1,309	1,185	898	40	72	96	
1955	2,109	1,432	1,103	832	50	104	119	
1956	1,721	1,358	1,392	774	62	107	115	
1957	1,707	918	778	636	41	152	84	
1958	2,101	1,221	1,303	723	75	172	143	
1959	2,384	1,287	1,195	981	67	110	167	
1960	2,284	1,614	1,251	1,049	67	132	140	
1961	3,202	1,292	1,184	921	68	104	148	
1962	3,298	1,535	1,501	1,789	104	210	209	
1963	3,610	1,587	1,315	581	113	146	342	
1964	3,930	1,746	1,811	1;326	131	224	291	
1965	5,373	1,888	1,731	1,750	168	256	352	
1966	5,495	2,120	2,259	1,687	195	262	404	
1967	6,173	2,534	2,026	2,000	217	408	541	
1968	5,850	2,479	2,578	1,712	198	546	454	
1969	7,756	3,236	2,982	2,936	237	394	587	
1970	7,977	3,457	3,772	2,203	315	490	672	
1971	7,667	3,785	3,916	3,498	272	634	863	
1972	8,085	3,681	3,879	3,054	407	708	1,047	1
1973	6,964	3,355	4,286	3,137	362	802	1,205	1
1974	6,772	3,511	4,194	3,032	409	763	1;503	1
1975	6,669	3,475	4,297	2,913	422	981	1,625	1
1976	5,636	3,495	4,475	2,733	464	824	1,696	1
1977	5,622	3,228	4,350	2,544	441	852	1,759	1
1978	5,724	3,358	4,181	2,157	450	952	1,949	1

NOTE: Excludes doctoral degrees awarded to non-U.S. citizens who planned to leave the United States following receipt of the degree.

SOURCE: National Research Council, Survey of Doctorate Recipients

TABLE 1.2   Percent of women among doctorates in selected fields,
             1940 to 1978

					% Women among doctorates in:				
	Math	Phys	Chem	Engr	Biol sci	Psych	Soc'l sci	Lang & lit	Other human
1940	2.6	6.7	1.4	0.0	14.1	33.9	9.3	19.5	11.0
1945	9.1	11.1	3.6	0.0	31.4	44.4	55.0	54.5	53.8
1950	5.8	1.8	2.7	0.5	8.9	17.2	9.0	16.3	11.4
1955	4.0	2.2	3.6	0.5	6.6	12.8	6.0	14.2	7.9
1960	4.3	1.8	5.0	0.4	10.0	12.0	8.4	23.2	14.8
1965	8.4	2.2	5.3	0.1	15.5	27.1	9.6	23.6	10.8
1970	7.7	2.2	7.7	0.5	14.0	21.6	10.2	33.2	19.8
1975	8.8	5.0	11.5	1.5	26.1	35.1	21.4	43.8	26.2
1978	13.8	4.0	12.6	2.2	24.2	37.8	26.2	49.8	31.7

SOURCE: National Research Council, Survey of Doctorate Recipients

Age and years of prior experience at receipt of doctorate

The median age at receipt of the doctoral degree is similar for
men and women, as reported in *Climbing the Academic Ladder: Doctoral
Women Scientists in Academe* (National Research Council, 1979). Earlier
findings which are reproduced here as Table 1.3 indicate that in some
fields, such as math and psychology, women on the average used to be
older than men at the time of Ph.D., but that this sex difference has
effectively disappeared. In all fields except the humanities, women
are now getting their doctorates at the same or a slightly younger age

		Math	Phys	Chem	Engr	Soc'l sci
1967	Men	28.1	28.6	27.7	29.9	29.8
	Women	29.7	27.5	28.0	*	29.4
1977	Men	29.1	29.5	28.6	30.0	29.5
	Women	29.0	29.1	28.2	28.2	29.3

*Median not computed for fewer than 20 individuals reporting a

SOURCE: Climbing the Academic Ladder: Doctoral Women Scienti
Academe, National Research Council, 1979, p. 28.

TABLE 1.4 Median number of years of professional work experie
to the doctorate, men and women doctorates in sele
fields, 1970 and 1978

	Math	Phys	Chem	Engr	Biol sci	Psych	Soc'l sci	Lang lit
1970								
Men	3.6	3.8	3.2	4.0	3.3	3.5	4.1	4.6
Women	3.0	3.7	3.7	*	2.6	3.3	3.3	4.7
1978								
Men	4.4	4.6	3.8	4.6	3.5	3.8	4.6	5.
Women	4.2	4.9	4.1	3.8	3.4	4.1	4.4	4.9

f the universities account for 40 percent of the total doc-
oduction. To identify the prestige of a department, we will
of reputational rankings developed in 1969 known as the
ersen ratings.

1.5 shows that in mathematics and physics men are somewhat
y than women to have earned doctorates from the most highly
artments, while the contrary is true for microbiology and
, where women have the higher percentage in the top depart-
e male-female comparisons for chemistry and sociology vary
ear to the next; over the 1967-1977 period in general, there
be little sex difference in prestige of Ph.D. department.

Number and percent of men and women who earned doctorates
from highly rated departments* for selected fields, 1967
to 1977

		1967 & 1968		1971 & 1972		1975 & 1976		1977	
		Men	Women	Men	Women	Men	Women	Men	Women
s	No.	865	44	1,039	83	906	87	372	49
	%	50.7	46.3	44.6	43.2	47.0	39.2	44.8	38.3
y	No.	1,390	54	1,535	41	1,077	48	502	28
	%	52.0	76.1	47.0	40.2	44.7	38.4	46.3	43.8
	No.	1,633	138	1,740	159	1,335	182	623	68
	%	49.3	53.5	45.2	42.1	44.2	47.5	44.8	37.8
ogy	No.	197	65	174	66	156	71	74	31
	%	35.4	47.4	27.2	40.2	29.2	37.2	32.7	36.0
	No.	287	65	395	104	391	189	191	88
	%	50.5	49.2	40.7	41.1	39.9	43.6	39.1	37.1
y	No.	894	292	1,089	490	1,080	631	501	320
	%	41.4	48.9	33.3	43.2	28.3	34.7	26.7	29.6

ratings of "di tinguished" or "strong" graduate faculty, as

Carnegie classification of institution*	Men	Women
Research university I	66.1%	63.1%
Research university II	19.5	20.2
Other doctorate-granting I	11.8	13.1
Other doctorate-granting II	2.6	3.5

*As found in A Classification of Institutions of Higher Educa
  Carnegie Foundation for the Advancement of Teaching, 1973.

SOURCE: National Research Council, Survey of Doctorate Recip

If we examine institutional origins of men and women Ph.
Carnegie classification (Table 1.6), the types of institution
are quite similar. About 83 percent of the women and nearly
of the men earned doctorates from a research university--one
leading institutions in terms of federal support of academic
and number of doctorates awarded annually.

Support during graduate school

Most graduate students finance their education at least
from sources other than their own or their family earnings.
common source of financial aid are teaching assistantships.
to 70 percent of the men and women Ph.D.s in recent years wer
supported at some time during their graduate training, with t
bility of teaching assistantships apparently highest in mathe
chemistry departments. Research assistantships, which are of
as more desirable than teaching assistantships, were reported
similar proportions of men and women. In examining changes i
patterns between 1970 and 1978 (Table 1.7), the most notable
the decline in availability of fellowships for both men and w
should be noted that the sharp fall-off in the percentage so

of faculty salaries. However, in the present data (Table 1.7) we find
very little difference in the percentages of men and women who held
research assistantships.

TABLE 1.7 Sources of support during graduate school, men and women
doctorates in selected fields (Respondents may indicate more
than one source, so percents will total more than 100%.)

	Math	Phys	Chem	Engr	Biol sci	Psych	Soc'l sci	Lang & lit	Other huma
1970 Men									
Teaching asst.	68%	60%	74%	38%	46%	50%	53%	69%	60%
Research asst.	37	72	57	54	41	47	38	6	14
Fellowship/									
traineeship	65	56	60	58	71	68	61	56	61
G.I. Bill	5	4	3	6	6	10	13	13	16
Own earnings	29	18	12	28	19	39	42	42	46
Spouse's earnings	14	12	10	12	15	22	23	24	28
Other	24	19	24	32	21	34	38	38	44
1970 Women									
Teaching asst.	77	73	69	33	41	38	45	60	48
Research asst.	35	78	51	40	32	36	33	8	14
Fellowship/									
traineeship	80	59	64	60	92	73	73	60	65
Own earnings	22	15	10	27	14	40	38	39	42
Spouse's earnings	22	17	7	33	10	25	24	24	21
Other	23	15	21	27	16	29	47	39	52
1978 Men									
Teaching asst.	79	67	81	38	52	48	54	71	56
Research asst.	34	78	68	69	48	35	36	9	13
Fellowship/									
traineeship	40	38	36	33	53	45	48	47	48
G.I. Bill	9	9	8	7	14	13	15	12	14
Own earnings	40	24	16	36	29	58	54	57	62
Spouse's earnings	22	24	25	22	32	35	33	35	37
Other	32	22	26	33	28	46	45	42	51
1978 Women									
Teaching asst.	77	67	84	40	51	45	51	67	55
Research asst.	33	71	71	73	40	32	35	10	13
Fellowship/									
traineeship	39	67	36	40	61	50	52	42	51
Own earnings	36	17	13	36	30	58	53	54	63
Spouse's earnings	32	21	20	36	28	30	31	40	35

engineering were married at the time of doctorate, compared w
thirds of the men. Only in physics, and to a lesser extent i
matics, are the recent women doctorates more often married th
men.

As shown in Table 1.8, marital status appears to have re
little effect on postdoctoral plans for recent women Ph.D.s.
who were married (most of whom were in their late twenties an
thirties), only a very small number (0-3 percent) did not pla
either employed or on a postdoctoral fellowship immediately f
the doctorate. For men, marital status does have one obvious
ship to plans: married men are far less likely to take a pos
appointment than are single men, as was noted in *Climbing the
Ladder*. In chemistry, for example, 62 percent of the single
planning postdoctoral study compared with only 45 percent of
married men.

Labor force participation after the doctorate

More than 92 percent of all women Ph.D.s who have receiv
torates in science, engineering, or humanities fields since 1
in the labor force as of 1979 (Table 1.9). The only noticeab
difference in rate of participation is found for men and wome
1950s cohort. Overall, this group has a lower percentage in
force in 1979 due to retirements, although there is no reason
believe that the 79 percent figure for women is due to a disp
tionately large number at retirement age.

It should be noted that of the 1975-1978 women Ph.D.s--t
most likely to be temporarily out of the labor force due to c
young children--less than 7 percent were unemployed voluntari

In Table 1.10, we examine any sex differences in full-ti
part-time employment and unemployment rates. About one out o
women held part-time positions, regardless of age group. The
of part-time employment among men was slight--less than one o
For all cohorts, the unemployment rate of women (based on tho
unemployed and seeking employment) is two to four times that
A higher unemployment rate for women has also been found when
separately by field.[1]

	Math	Phys	Chem	Biol sci	Psych	Soc'l sci	Lang & lit	Other human
O Men								
Married	753	1,074	1,448	1,977	1,094	1,643	873	1,325
% Planning empl.	93	62	64	52	87	96	97	98
% Planning postdoc.	7	38	36	47	13	4	2	2
% Other plans	<1	<1	0	1	0	<1	1	<1
Not married	265	323	443	401	242	353	247	323
% Planning empl.	88	50	50	36	83	94	97	95
% Planning postdoc.	11	49	50	63	17	6	3	5
% Other plans	1	1	<1	1	<1	<1	<1	0
Women								
Married	41	22	90	256	249	152	295	170
% Planning empl.	95	59	55	44	84	86	92	86
% Planning postdoc.	0	41	41	52	15	10	4	9
% Other plans	5	0	4	4	1	4	4	5
Not married	27	14	70	190	139	101	220	161
% Planning empl.	96	43	53	40	87	88	97	97
% Planning postdoc.	4	57	46	59	13	12	2	2
% Other plans	0	0	1	1	0	0	1	1
Men								
Married	333	537	757	1,402	1,093	1,447	480	971
% Planning empl.	91	50	55	37	83	94	95	95
% Planning postdoc.	9	50	45	63	16	6	5	5
% Other plans	0	0	0	0	1	<1	<1	<1
Not married	278	335	437	701	555	576	255	496
% Planning empl.	80	37	38	24	76	89	92	92
% Planning postdoc.	19	63	62	76	24	10	7	8
% Other plans	1	0	0	<1	<1	1	1	<1
Women								
Married	58	31	96	394	454	370	407	342
% Planning empl.	93	48	53	32	79	88	90	88
% Planning postdoc.	5	52	44	67	19	11	7	9
% Other plans	2	0	3	1	2	1	3	3
Not married	46	13	82	317	464	303	290	265
% Planning empl.	89	38	45	27	78	88	93	92
% Planning postdoc.	9	62	55	73	22	12	7	7
% Other plans	2	0	0	<1	<1	0	<1	1

Year of doctorate	Total doctorates in U.S. population		% In lab
	Men	Women	Men
1950-1959	50,791	4,167	93.4
1960-1969	101,391	11,493	98.6
1970-1974	90,225	16,243	99.0
1975-1978	64,857	18,492	98.0

TABLE 1.10 Employment status in 1979 by year of doctorate, me women doctorates in science, engineering, and huma

	No. in labor force	% Of labor force			
		Full-time	Part-time	Post doc	s
Men					
1950-1959	47,457	96.6	2.7	0.1	
1960-1969	99,997	96.8	1.9	0.6	
1970-1974	89,278	95.6	2.2	1.4	
1975-1978	63,553	86.0	2.7	9.9	
Women					
1950-1959	3,301	84.6	11.1	1.6	
1960-1969	10,610	84.4	12.0	1.1	
1970-1974	15,153	81.7	12.8	2.4	
1975-1978	17,492	73.6	11.2	10.4	

Previous studies of the status of women in science have
largest sex differences in academic rank and pay occur for o
women Ph.D.s, who have tended to start at lower salaries and
more slowly than men. This group is often viewed as the las
benefit from affirmative action mandates. In the following
we will examine the differences in academic career outcome,
observed in 1979, between men and women in a matched-pair sa
received their Ph.D.s in the period 1940-1959. Chapters 3 t
analyze matched pairs of men and women from later cohorts--1
1970-1974 and 1975-1978.

The matching procedure

Out of a total sample of 49,671 Ph.D.s from the years 1
responses were received from 32,877 individuals or 66 percen
For the present report, pre-1940 Ph.D.s (who would tend to b
retired) and those residing outside the U.S. were deleted, r
in a data base of 29,410 individuals, 10,278 women and 19,13
attempt was made to match each woman with two men according
characteristics: year in which the Ph.D. was received, fiel
institution from which the doctorate was awarded, and race.

Some flexibility in the matching was necessary. In mat
year of Ph.D., a sliding scale was used for allowable male-f
differences. Women doctorates since 1970 were required to h
matches with the same year of Ph.D. or a difference of only
Pre-1970 Ph.D.s were allowed a difference of 2-5 years. Mat
field of Ph.D. were ideally by specialty (i.e., nuclear phys
polymer chemistry); three-fourths of the males and females u
this analysis were so matched. The other one-fourth do not
fine field, but are in the same broad field or discipline (e
physics, chemistry). Similarly, the Ph.D.-granting institut
used for the matching procedure, but when this was not possi
prestige of the doctorate-granting department, as indicated

or the agricultural sciences.[1] Matching by race was according to four categories: white, Asian, black, and other.

The above procedure produced a set of 5,164[2] triads of one female and two males, or a total of 15,492 individuals. This group, which will be hereafter referred to as "A" matches, is used in the female-male comparisons of labor force participation, part-time employment, and marital status found in the beginning sections of chapters 2 through 5. The numbers of "A" matches within each cohort are as follows:

1940-1959 Ph.D.s	1,119
1960-1969 Ph.D.s	1,512
1970-1974 Ph.D.s	1,288
1975-1978 Ph.D.s	1,245
Total	5,164

A subset of the 5,164 triads, which we will call "B" matches, are in addition matched by 1979 employment sector (i.e., academic, government, industry, other) and by number of full-time equivalent years experience with a difference not to exceed 5 years. The number of "B" matches are:

Academic sector	2,138
Business/industry	332
Federal government	85
Other	528
Total	3,083

The numbers of matched triads within industry or government, when also controlled by Ph.D. cohort, are generally too small to permit separate analyses of their employment patterns. For this reason, the present report will focus on career outcomes of men and women in academe.[3]

---

[1]Engineering and earth science figures are also not reported separately, for reasons of a small sample size rather than unavailability of Roose-Andersen ratings of departments.

[2]This represents 66 percent of the total number of females in the

The matching procedure described above produced 1,119 pairs "A" matches of male and female survey respondents from the 1940- cohort, two-thirds of whom are 1950s graduates (Table 2.1). The portion of married and not married women in the group to be exam is about evenly split. Unfortunately, the information as collec on the questionnaire does not allow us to distinguish between th never married and those who are widowed or divorced. The 52 per reported here as not married may include a substantial number wh widowed, considering that one-half of the women are age 60 and o

TABLE 2.1   Characteristics of the 1940-1959 women Ph.D.s in the
            matched men and women sample

Number of women	1,119
Age in 1979	
45 & under	<1%
46-49	9
50-54	21
55-59	24
60-64	20
65 & over	26
Year of doctorate	
1940-1944	14%
1945-1949	20
1950-1954	28
1955-1959	38
Marital status	
Married	48%
Not married	52
(incl. widowed, divorced)	

e proportion of women in the work force is lower than that for men
t never drops below 80 percent.

BLE 2.2 Employment status of matched pairs of men and women who earned
doctorates in the 1940s and 1950s

	Size of matched-pair sample	Number under age 65	Under age 65 only			
			Full-time	Part-time	Seeking empl	No 1 f
l fields						
Men	1,119	892	91%	3%	<1%	
Women	1,119	819	74	10	2	
th						
Men	82	70	91	3	0	
Women	82	62	79	10	2	
ysics						
Men	78	70	90	0	1	
Women	78	65	74	6	0	
emistry						
Men	134	121	93	2	0	
Women	134	117	7	10	2	
ological sci.						
Men	256	206	88	2	2	
Women	256	192	67	9	4	
ychology						
Men	151	133	89	5	0	
Womdn	151	120	80	11	1	
cial sci.						
Men	141	103	91	3	0	
Women	141	90	81	9	1	
nguages & lit.						
Men	84	51	92	4	2	
Women	84	53	81	9	0	
her humanities						
Men	130	85	91	5	0	
Women	130	67	75	12	1	

examined by sector since the job structure and rewards are [...] different in academic, industrial, and government careers. [...] matches also control for any large male-female differences [...] equivalent years of professional experience, a requirement [...] particularly important for the older Ph.D. group. For exam[...] matching we find that among those surveyed 30-35 years afte[...] torate, married women generally have accumulated 7-12 fewer [...] experience than all others (Table 2.3). This is less true [...] women who are somewhat younger (20-25 years past the doctor[...]

The total numbers of the "B" matches available are sho[...] Table 2.4. The only sector for which there is a sufficient [...] sample for analysis is for those in academe, which here inc[...] four-year colleges, universities, and medical schools.

TABLE 2.3   Median number of years of professional experienc[...]
            equivalent) as of 1979, compared with elapsed ti[...]
            Ph.D.

Before matching

Year of Ph.D.	Elapsed time	Years FTE experience		
		Men		W[...]
		Married	Not married+	Married
1944	35.0 yrs.	37.1	*	30.0
1949	30.0	32.8	31.6	20.9
1954	25.0	26.8	24.9	24.6
1959	20.0	22.2	21.5	19.9

*Insu ficient number of cases for computing median.

	Number of male/female pairs
Total sample ("A" matches)	1,119
Pairs matched by sector/experience ("B" matches)	
Academic	406
Industry	50
Federal government	25

Most of the academically employed, who were surveyed in 1979--which is 20 or more years after the Ph.D.--were full professors, as one might expect. (Table 2.5) Worth noting, however, is the fact that in the biosciences as many as one-third of the women were still at the rank of associate or assistant professor, as were one-fourth of the women in psychology and literature departments.

Tenure status is also a problem for women in certain fields. Of the women bioscientists with faculty status, 16 out of 78 had not been awarded tenure whereas all of the matching men in the sample had. A statistically significant difference in the proportion tenured was also found among male and female faculty in psychology and language and literature departments (Table 2.6).

Salaries

Large differences in median salaries as of 1979 of the women and matching men were observed. For all fields combined, the women earned $3,800 or 11 percent less each year than the men in the sample (Table 2.7).

Even if the salary comparisons are limited to full professors, the overall sex difference i narrowed but remains signifi an at

TABLE 2.5   Type of position held by matched pairs of men and wom
who earned doctorates in the 1940s and 1950s

	Total academic	Faculty	Prof	Assoc prof	Asst prof	Instr
All fields						
Men	406	386	354(87%)	29	2	1
Women	406	351	258(64%)	81	11	1
Math						
Men	42	40	38(90%)	2	0	0
Women	42	40	35(83%)	4	1	0
Physics						
Men	24	20	15(62%)	5	0	0
Women	24	20	15(62%)	5	0	0
Chemistry						
Men	30	28	23(77%)	5	0	0
Women	30	22	14(47%)	7	1	0
Biological sci.						
Men	93	88	77(83%)	10	1	0
Women	93	78	46(49%)	25	6	1
Psychology						
Men	43	45	43(90%)	1	1	0
Women	48	43	30(62%)	11	2	0
Social sci.						
Men	58	57	56(97%)	1	0	0
Women	58	51	42(72%)	9	0	0
Languages & lit.						
Men	46	45	42(91%)	3	0	0
Women	46	42	31(67%)	10	1	0
Other humanities						
Men	48	47	45(94%)	1	0	1
Women	48	40	33(69%)	7	0	0

	Total academic	Number faculty	Number tenured	Percent tenured	Not tenur...
l fields					
Men	406	386	379	98%	7
Women	406	351	313	89*	38
h					
Men	42	40	39	98	1
Women	42	40	36	90	4
ysics					
Men	24	20	18	90	2
Women	24	20	20	100	0
emistry					
Men	30	28	26	93	2
Women	30	22	21	95	1
ological sci.					
Men	93	88	88	100	0
Women	93	78	62	79*	16
ychology					
Men	48	45	45	100	0
Women	48	43	37	86*	6
cial sciences					
Men	58	57	57	100	0
Women	58	51	50	98	1
nguages & lit.					
Men	46	45	45	100	0
Women	46	42	39	93*	3
her humanities					
Men	48	47	45	96	2
Women	48	40	36	90	4

ex difference is statistically significant at .05 level.

| Field of doctorate | All academic positions | | | Full |
	Men	Women	% Less	Men
All fields	$34,100	$30,300	11%	$35,000
Math	34,000	33,700	<1	35,500
Physics	36,000	31,700	12	34,500
Chemistry	29,800	25,600	14	30,500
Biological sciences	34,000	29,400	14	35,000
Psychology	37,000	34,200	8	36,500
Social sciences	36,000	31,300	13	38,000
Languages & literature	30,300	27,200	10	31,300
Other humanities	30,000	29,500	2	31,500

It is interesting to note that a $6,200 salary diff
1977 for men and women full professors of chemistry was
Climbing the Academic Ladder (National Research Council,
repeating the analysis, but this time including only men
known to have the same characteristics, i.e., pairs matc
quality of Ph.D. department, years since doctorate, expe
specialty, the differential was only reduced from $6,200

PAIRED DOCTORATES WHO RECEIVED PH.D.s IN THE 1960s

As was noted in chapter 1 of this report (see Table 1.1), the
1960s saw a boom in graduate enrollments and Ph.D. production of both
men and women. Federal support for training during the post-Sputnik
era was generous, with particularly large investments in engineering-
related disciplines. During this period, the number of Ph.D.s awarded
annually in the physical sciences and engineering more than tripled--
from about 2,350 in 1960 to nearly 8,000 in 1969.

More than 50 percent of those receiving doctorates during this
decade entered academic employment, with the exception of predominantl
industrial employment among chemists and engineers and substantial
self-employment among Ph.D. psychologists. The proportions of men and
women who took academic jobs are shown in Table 3.1. The only strikin
sex differences that remain consistent over the 1960-1968 period are
in chemistry and physics, with a higher proportion of women in the
academic sector, and conversely, their lower representation in
industry. Ph.D.s in mathematics resemble humanists and social scien-
tists (excluding economists) more than they do physical scientists in
their predominantly academic orientation. Women doctorates in
engineering are substantially less likely than men to be employed in
academe, reversing the situation in most other science fields.

The group of 1960-1969 Ph.D.s that we will be examining consists
1,512 pairs of men and women who were selected on the basis of matchec
characteristics from respondents to a 1979 national survey (as
described on pages xv and 12-14). The median age of the women in
this sample is 45 (Table 3.2). Thus, the present analyses should
provide a profile at mid-career. Most of the pairs are 1965-1969
Ph.D.s. More than half of the women (59 percent) were married as of
1979 but less than half (44 percent) had children. It is interesting
to note that the proportion who were married is far below the 80
per ent rate for the general female popula ion in he U.S. in the

| | 1960-1964 Ph.D.s | | 1965-19 |
	Men	Women	Men
Mathematics	68.6%	78.1%	74.5%
Physics	48.3	51.2	47.6
Chemistry	22.9	39.7	26.0
Engineering	39.7	31.0	34.3
Biosciences	56.0	66.1	58.8
Psychology	46.4	47.0	58.0
Economics	62.1	59.3	64.5
Other social sci.	71.6	66.3	78.0
Humanities	87.2	84.0	88.6

SOURCE: Harmon, 1978, p. 79.

TABLE 3.2   Characteristics of the 1960-1969 women Ph.D.s in
            matched men and women sample

Number of women	1,512
Age in 1979	
Under 40	18%
40-44	30
45-49	21
50-54	15
55 and over	16
(median age is 45)	
Year of doctorate	
1960-1964	35%
1965-1969	65
Marital status*	
Married	
Have children	38%
No children	21
Not married	
Have children	6

...eld: in mathematics, chemistry, social sciences, and humanities,
...ly one out of 18 of the women was part-time employed compared to one
... five of the women physicists.

...LE 3.3 Employment status of matched pairs of men and women who earned
doctorates in the 1960s

...eld ...d sex	Size of matched-pair sample	Total in labor force	Full-time empl	Part-time empl	Post doc	Unempl. and seeking
...l fields						
Men	1,512	1,490	95%	2%	1%	1%
Women	1,512	1,424	82	10	1	1
...th						
Men	136	134	96	1	1	0
Women	136	126	86	6	1	0
...ysics						
Men	97	97	98	2	0	0
Women	97	93	73	19	2	2
...emistry						
Men	162	162	95	2	2	1
Women	162	155	88	6	2	0
...ological sci.						
Men	347	343	95	1	1	2
Women	347	319	74	14	1	2
...ychology						
Men	155	153	92	5	1	1
Women	155	150	85	10	1	1
...cial sci.						
Men	171	166	94	2	1	1
Women	171	166	88	6	1	1
...nguages & lit.						
Men	135	132	95	1	0	1
Women	135	130	87	6	1	2
...her humanities						
Men	190	185	94	2	1	1
Women	190	176	85	6	1	1

% of Total

Unempl. No...
l...
f...

TABLE 3.4   Matched pairs of men and women in academe in 1979
           plans at time of doctorate (1960-1969)

	No. in sample	Planning immediate employment	Planning postdoctoral fellowship
Math			
Men	101	93%	7%
Women	101	92	5
Physics			
Men	50	66	34
Women	50	64	27
Chemistry			
Men	65	65	35
Women	65	57	34
Biological sci.			
Men	183	40	59
Women	183	51	47
Psychology			
Men	81	74	24
Women	81	80	17
Social sciences			
Men	128	98	2
Women	128	97	1
Languages & lit.			
Men	110	97	3
Women	110	97	1
Other humanities			
Men	133	98	2
Women	133	93	2

Portions.

	Total academic	Faculty	Prof	Assoc prof	Asst prof	Instr	Non-faculty	0 r
fields								
en	893	93	53	35	4	0	2	
omen	893	85	34	37	13	1	6	
h								
en	101	95	52	38	6	0	1	
omen	101	95	38	44	13	1	2	
sics								
n	50	80	32	44	4	0	10	
omen	50	68	20	30	14	4	18	
istry								
en	65	85	51	31	3	0	5	
men	65	72	22	34	12	5	14	
logical sci.								
en	183	91	42	41	9	0	3	
omen	183	67	20	34	22	1	12	
chology								
en	81	91	58	30	4	0	4	
omen	81	90	31	44	15	0	5	
ial sci.								
en	128	98	71	26	1	0	2	
omen	128	91	54	32	5	0	2	
guages & lit.								
en	110	93	51	38	4	0	0	
omen	110	89	42	36	11	0	2	
r humanities								
en	133	98	62	35	2	0	1	
omen	133	94	46	42	5	1	2	

than the woman to have been promoted to full professor. [...]
bioscience, and psychology the man is <u>twice</u> as likely as t[...]
be so promoted (Table 3.6). Moreover, the male professors [...]
as likely to be employed in highly rated departments (11 p[...]
are female professors (6 percent).[1]

TABLE 3.6   Ratio of number of male full professors to numb[...]
full professors among matched male-female pairs[...]
1960-1969 Ph.D.s

All fields	1.5
Mathematics	1.4
Physics	1.6
Chemistry	2.4
Biological sciences	2.1
Psychology	1.9
Social sciences	1.3
Languages and literature	1.2
Other humanities	1.3

Of the men and women Ph.D.s who are in senior faculty [...]
as of 1979, nearly all have been awarded tenure. However, [...]
associate professors lag somewhat behind men in receiving [...]
the difference is statistically significant in mathematics [...]
and social science departments (Table 3.7). The elapsed t[...]
Ph.D. to awarding of tenure is also longer for the women i[...]
than the men, for all fields combined (Table 3.8).

| | Total academic sample | | Associate professors | | | |
	Men	Women	No. of men	No. of women	Percent tenured Men	Women
	893	893	314	329	91	83*
	101	101	38	44	97	80*
	50	50	22	15	82	94
	65	65	20	22	100	95
sci.	183	183	75	63	88	73*
	81	81	24	36	72	53
	128	128	33	41	94	85*
, lit.	110	110	42	40	98	95
ities	133	133	46	56	93	95

rence is statistically significant at .05 level.

Elapsed time from Ph.D. to tenure for matched pairs of men and women in academe who earned doctorates in the 1960s

Total academic	Faculty	Tenured faculty	Time-to-tenure 4 yrs or less	5-8 yrs	9 yrs or more	Not reported
893	830	770	284 (37%)	345 (45%)	111 (14%)	30 (4%)

largest discrepancies in pay are found in biosciences, che
psychology and amount to $3,500 to $4,500 annually. Not s
these are the same fields in which wide sex differences in
rank were documented (Table 3.5).

In chapter 6, we will examine academic salaries furth
utilizing regression analyses to determine the significanc
findings and the extent to which salaries are aligned with
educational and demographic characteristics.

TABLE 3.9 Median annual salaries of matched pairs of men ar
academe who earned doctorates in the 1960s

Field of doctorate	All academic positions		Female sa $ differenc
	Men	Women	
All fields	$28,400	$25,500	$2,900
Math	28,200	25,100	3,100
Physics	27,400	25,300	2,100
Chemistry	27,300	23,600	3,700
Biological sci.	28,500	24,000	4,500
Psychology	29,500	26,000	3,500
Social sci.	31,100	28,400	2,700
Languages & lit.	25,800	25,300	500
Other humanities	26,900	24,200	2,700

PAIRED DOCTORATES WHO RECEIVED PH.D.s IN 1970-1974

The sex differences we have examined up to this point concerned women who began their careers prior to 1970. To what extent have employment characteristics of men and women converged for more recent Ph.D.s, and is there any evidence suggesting sex discrimination among young women scientists and scholars? Since the possibility of so-called reverse discrimination is also raised by some observers, we will explore the extent to which this may exist.

First, it should be pointed out that the criteria for selecting matched male-female pairs from this cohort were especially strict. As part of the "A" match[1] within each pair, there is agreement on field of doctorate, quality of Ph.D. institution, race, and year of Ph.D. (within one year). In as many as 85 percent of the 1,316 pairs from this cohort, the man and woman had not only the same field, such as physics or chemistry, but also the same specialty (e.g., nuclear physics, polymer chemistry).

The average year of Ph.D. for the sample is 1972. Therefore, the employment data we will analyze typically describe an individual's situation 7 years after the Ph.D. In terms of academic employment it is thus an appropriate cohort for which to examine tenure decisions.

The women in this group have a median age of 37 (Table 4.1). Two-thirds are married but less than half have children. It is assumed that most of those without children have made final family decisions, since the majority are age 35 or older.

Employment status

TABLE 4.1 Characteristics of the 1970-1974 women in the matched
and women sample

Number of women	1,288
Age in 1979	
Under 35	25%
35-39	44
40 and over	31
(median age is 37)	
Year of doctorate	
1970	18%
1971	17
1972	22
1973	21
1974	23
Marital status*	
Married, have children	38%
Married, no children	28
Not married, have children	6
Not married, no children	29

*"Not married" includes widowed, divorced. "Have children" refe
one or more children under age 18.

	sample	empl.	empl.	doc	empl.	empl.
	1,316	93%	2%	3%	1%	1%
ve children*	788	94	2	2	<1	1
children	215	91	3	2	2	2
,+ have children	44	95	2	2	0	0
, no children	147	88	3	4	2	3
	1,316	78	72	3	2	5
ve children	465	65	19	2	4	10
children	340	82	10	3	2	3
, have children	71	89	11	0	0	0
, no children	359	88	4	4	1	3

en" refers to one or more children under age 18.
" includes widowed, divorced.

tus

the 1979 survey, the men and women in this cohort were
e years past the doctorate. By this time, most Ph.D.s who
cally employed hope to have a tenured faculty appointment.
prior to a tenure decision and/or a promotion to associate
aries by institution. In some cases, a faculty appoint-
assistant professor may carry tenure status. In other
s a newly recruited associate professor may be ineligible
for the first year or two.

1, 43 percent of those in the matched-pair sample of
h.D.s had tenure by 1979, reporting an average of 4 years
h.D. to tenure. However, the likelihood of achieving
979 was far greater for men than women. Of those who
ate professors, men and women were equally likely to be
Among assistant professors, men were tenured at twice the
en, although the percentage was relatively low for both
e 4.3).

TABLE 4.3   Tenure status of matched pairs of men and women i
             in 1979 who earned doctorates during the period 1

	Total academic sample		Associate professors		Assis profe
	Number	% tenured	Number	% tenured	Number
Men	711	52	317	82	233
Women	711	35	231	81	280

In terms of faculty rank, there were statistically sig
differences between the matched men and women in nearly eve
For all disciplines combined, 51 percent of the men were as
professors or full professors by 1979, compared with only 3
of the women.   In each field (Table 4.4), the distribution
less favorable for women than men, based on their lower num
senior faculty, and their greater concentration among assis
professors and nonfaculty appointees.   There is no evidence
"reverse discrimination" among the more recent Ph.D.s.

The sex differences in rank are much larger in science
ments than in humanities disciplines.   For example, the sex
male to female associate and full professors is nearly 2 to
physics and biosciences but only about 1.2 to 1 in social s
and humanities (Table 4.5).   It is also evident that for bo
women, the opportunities for young Ph.D.s to move up in fac
were relatively limited in physics, chemistry, and the biol
sciences.

Type of position held by matched pairs of men and women in academe who earned doctorates in 1970-1974

	Total academic	Faculty	Prof	Assoc prof	Asst prof	Instr	Non-faculty	Other/ no report
s								
	711	610	55	317	233	5	56	45
	711	559	33	231	280	15	73	79
	56	52	1	38	12	1	3	1
	56	53	1	24	26	2	1	2
	47	28	1	14	13	0	9	10
	47	28	0	8	19	1	10	9
	40	31	2	14	15	0	3	6
	40	26	0	11	14	1	10	4
l sci.								
	172	137	4	61	70	2	25	10
	172	126	2	33	85	6	33	13
y.								
	49	43	6	28	9	0	4	2
	49	37	3	18	16	0	5	7
i.								
	77	71	12	36	23	0	2	4
	77	65	8	32	25	0	6	6
& lit.								
	100	95	6	50	39	0	1	4
	100	84	2	41	40	1	2	14
anities								
	119	113	18	56	38	1	1	5
	119	102	13	49	38	2	1	16

	Math	Phys	Chem	Biol	Psych	Soc'l sci	Lan li
% Senior faculty*							
in 1979							
Men	70	32	40	38	69	62	5
Women	45	17	28	20	43	52	4

*Associate professor or full professor

Since the most notable differences in rank between th
men and women are in the sex distribution of associate vs
professorships, we will take a closer look at promotions c
faculty that occurred between 1975 and 1979, and the facto
be correlated with promotion rates.

Faculty promotions

A number of possible explanations have been offered
generally lower faculty status of women Ph.D.s: a lower
to research or their heavier teaching loads; greater dema
family responsibilities that are assumed to reduce time a
mance; a lower degree of geographic mobility because of t
spouse's job location.

Many of these assumptions can be tested by the infor
available. For example, in examining sex differences in
between 1975 and 1979 we are able to control for whether
faculty member was engaged primarily in research or in te
the beginning of this period, whether or not he or she ha
and the extent of inter-institutional moves according to
status.

It has already been shown that of the 1970-1974 Ph.D

	Number			by 1979	
	Men	Women		Men	Women
	7	1			
...rofessor	57	43		28%	30%
...rofessor	193	224		62%	44%
	43	87		47%*	53%*
...sample+	300	355			

...o had faculty appointment by 1979.

...s in matched-pair sample who were academically employed and ...heir rank in both 1975 and 1979.

...were 300 men and 355 women in our sample for whom 1975 and ...nation was available. This includes 417 who were assistant ...in 1975 of whom 193 are men and 224 are women. Overall, ...of the men were promoted to associate professor by 1979 ...ith 44 percent of the women (Table 4.6).

...omen who were primarily engaged in research did not fare any ...romotions than those who devoted most of their time to ...Table 4.7). In fact for both the men and women, those ...teaching as their primary activity in 1975 were more likely ...oted than all others.

TABLE 4.7 Faculty promotions between 1975 and 1979 by primary work a
for matched pairs of 1970-1974 Ph.D.s

| | Primary activity, 19 | |
	Teaching	Research
<u>Men</u> (N = 300)		
Professor in 1975	5	0
Associate professor in 1975	41	12
Promoted to professor by 1979	10	5
Assistant professor in 1975	138	52
Promoted to assoc. prof. by 1979	88 (64%)	31 (60%)
Nonfaculty position in 1975	7	34
Faculty appt. by 1979	2	16 (47%)
Total in sample	191	98
<u>Women</u> (N = 355)		
Professor in 1975	0	1
Associate professor in 1975	33	3
Promoted to professor by 1979	7	3
Assistant professor in 1975	162	53
Promoted to assoc. prof. by 1979	77 (48%)	17 (32%)
Nonfaculty position in 1975	9	75
Faculty appt. by 1979	5	38 (51%)
Total in sample	204	132

...st — less children. We also have to consider that there may have
...en more of the unmarried women already at the higher ranks in 1975.
...t even considering this, the net result was that by 1979, married
...men with children were just as likely as unmarried women with no
...ildren to be at the senior faculty rank (Table 4.9). All groups
... women lagged behind men in the percentage at senior ranks.

TABLE 4.8 Faculty promotions between 1975 and 1979 by marital status
in 1979 for matched pairs of men and women who earned
doctorates during the period 1970-1974

| | Married | | Not married | |
	Children	No children	Children	chi...
...n (N in sample = 300)				
Professor in 1975	3	1	1	
Associate professor in 1975	39	4	1	
Promoted to prof. by 1979	11	2	0	
Assistant professor in 1975	125	35	5	
Promoted to assoc. prof. by 1979	83 (66%)	18 (51%)	4	
Nonfaculty position in 1975	21	13	1	
Faculty appt. by 1979	12	4	0	
Total in sample	188	53	8	
...men (N in sample = 355)				
Professor in 1975	0	0	0	
Associate professor in 1975	10	10	2	
Promoted to assoc. prof. by 1979	5	5	0	
Assistant professor in 1975	74	63	10	
Promoted to assoc. prof. by 1979	38 (51%)	26 (41%)	3	
Nonfaculty position in 1975	30	27	2	

	Married		Not married*	
	Children	No children	Children	No children
Men				
Total, academic sample	188	53	8	29
Senior faculty N	129	24	6	14
in 1979 %	(69%)	(45%)		(48%)
Women				
Total, academic sample	114	100	14	106
Senior faculty N	46	36	5	41
in 1979 %	(40%	(36%)		(39%)

*Including widowed, divorced

Female assistant professors who changed employers between 1975 and 1979 did not materially improve their status while men who moved did. Of those who were assistant professors in 1975 and moved, more than one-half of the men reported a rank of associate professor at the new institution in 1979 compared with one-sixth of the women (Tab

Women faculty were more likely than men to have changed employer between 1975 and 1979--28 percent did so compared with 19 percent of the men (Table 4.11). We do not know whether the reasons for moving were (1) their initial appointment was short-term and was not renewed (2) they were denied a promotion, or (3) they were denied tenure. In other words, those who moved may have either responded to a better opportunity elsewhere or may have been "pushed" out. The fact that few of the women assistant professors who moved improved their prospects may indicate that the latter is true. We do know that women were somewhat more likely to have changed institutional affiliation whether by choice or by necessity. This finding casts some doubt on the argument that they are less able to move.

Table 4.11 shows the following pattern of moving among the

	Total in sample		Stayed at same institution, 1975-1979		Switched institution 1975-1979	
	Men	Women	Men	Women	Men	Women
...rofessor in 1975	7	1	7	1	0	
...ssociate professor in ...975	57	43	50	39	6	
Promoted to professor by 1979	16	13	13	12	2	
...ssistant professor in ...975	193	224	164	174	24	4
Promoted to assoc. prof. by 1979	120	98	103 (63%)	90 (52%)	14 (58%)	(1
...onfaculty position in ...975*	43	87	17	36	22	4
Faculty appt. by 1975	24	47	9	14	14	2

*Includes instructors.

TABLE 4.11 Employer switches 1975-1979 by tenure status

	Total in sample		Stayed at same institution, 1975-1979		Switched institution 1975-1979	
	Men	Women	Men	Women	Men	Women
...aculty status in 1975	312	385	252 (81%)	278 (72%)	60 (19%)	107 (28%)
Faculty Te ured	53	38	4	36	6	2

Without considering the type of position held, male and [...]
faculty were equally likely to be located in the more highly r[...]
departments within their field. This is in contrast to the pa[...]
for 1960s Ph.D.s, with men more frequently employed in the top[...]
departments (page 26).

TABLE 4.12 Number and percent of 1970-1974 doctorates employe[...]
highly rated departments* in 1979 (by Roose-Anders[...]

	No. employed all departments+		No. employed highly rated departments		% em high depa
	Men	Women	Men	Women	Men
Total academic empl.	607	596	52	64	8.6
Faculty	522	474	39	36	7.5
Professor	47	28	1	0	2.1
Associate professor	270	204	20	12	7.4
Assistant professor	200	228	18	24	9.0
Instructor	5	14	0	0	0.0
Non-Faculty	46	61	12	17	26.1

*Highly rated departments are those with ratings of 3.0 - 3.9 [...]
or 4.0 - 5.0 (distinguished), as found in Kenneth D. Roose an[...]
Charles J. Andersen, A Rating of Graduate Programs, American [...]
on Education, Washington, D.C., 1970.

+Includes numbers in sample who were employed in fields rated [...]
Roose and Andersen.

Median salaries

For the matched-pair sample of 1970-1974 Ph.D.s, the wome[...]
median salary that was $1,200 or 5 percent below that for men [...]

ce in median salary will be $5,600. In the 20 year period,
e member of the pair would have been paid $60,500 less than

aries are also considered in chapter 6, which includes
on analyses for male and female faculty at leading research
ties.

3 Median annual salaries of matched pairs of men and women
in academe in 1979 who earned doctorates during the
period 1970-1974

	All academic positions		Female salaried less by:	
	Men	Women	$ Difference	% Difference
s	$22,500	$21,300	$1,200	5%
	22,600	21,100	1,500	7
	22,600	22,200	400	2
	21,800	20,800	1,000	5
l sci.	23,200	21,000	2,200	9
y	22,900	22,600	300	1
i.	22,200	22,600	- 400	- 2
& lit.	20,900	19,400	1,500	7
anities	21,900	20,400	1,500	7

PAIRED DOCTORATES WHO RECEIVED PH.D.s IN 1975-1978

By the late 1970s, women were receiving 20 percent of [a]
torates in science and engineering and 38 percent of the deg[
humanities.[1] The surge in Ph.D. production for women coinci[
rather tight academic job market. Except in fields such as [
ing and computer sciences, the supply of new Ph.D.s desiring[
appointments exceeded the number of available positions resu[
keen competition for tenure-track slots.

Nonetheless, the number of women on science faculties i[
much faster than overall faculty growth between 1973 and 197[
is the first report that examines the initial employment cha[
tics of women Ph.D.s since 1977.

As noted in chapter 1, the most recent women doctorate[
be younger at the time of Ph.D. than their predecessors. As[
the sample of 1975-1978 women Ph.D.s had a median age of 32 [
60 percent were married at the time of the survey; less than[
third had children. The largest group of women were not mar[
children (38 percent).

Employment status

A recent publication noted 1979 unemployment rates for [
Ph.D.s that are two to five times higher than those for men [
field.[3] While this is true for every age category, it is es[

---

[1]*Summary Report, 1978 Doctorate Recipients,* National Resear[
1979, pp. 32-33.

or any earlier cohort.

verall labor force participation for women is close to 100
in all fields but the biological sciences (92%). Among
ntists there are also a substantial number who were on post-
al fellowships or traineeships in 1979.

5.1 Characteristics of the 1975-1978 women doctorates in the
matched men and women sample

of women	1,245
1979	
r 30	14%
4	53
9	20
nd over	13
ian age is 32)	
f doctorate	
	23%
	25
	28
	24
l status	
ied, have children	27%
ied, no children	31
married,* have children	4
married,* no children	38

ding widowed, divorced

TABLE 5.2 Employment status of matched pairs of men and women who
           doctorates during the period 1975-1978

Field and sex	Size of matched-pair sample	In labor force	% of Total		
			Full-time empl	Part-time empl	Pos doc
All fields					
Men	1,245	98	79	3	15
Women	1,245	95	68	8	16
Math					
Men	77	99	94	1	3
Women	77	99	88	6	3
Physics					
Men	94	99	78	0	20
Women	94	98	60	4	30
Chemistry					
Men	121	97	81	2	13
Women	121	96	64	6	22
Biological sci.					
Men	296	98	56	1	41
Women	296	92	46	3	39
Psychology					
Men	104	99	84	5	8
Women	104	97	78	13	4
Social sci.					
Men	107	99	96	3	0
Women	107	97	82	7	4
Languages & lit.					
Men	126	98	91	4	1
Women	126	95	78	13	0
Other humanities					
Men	158	97	83	10	1
Women	158	97	78	15	1

Table 5.3 shows the type of position held by the matched men and
men who were academically employed as of 1979, or one to four years
ter receipt of the doctorate. About 25 percent of the recent Ph.D.s
re in nonfaculty slots, although this category includes mostly
stdoctoral fellows and trainees.

LE 5.3   Type of position held by matched pairs of men and women in aca
who earned doctorates in 1975-1978

	Total Academic	Faculty	Prof	Assoc prof	Asst prof	Instr	Non-faculty	O re
fields								
en	674	450	10	60	365	15	165	
omen	674	416	3	30	344	39	183	
h								
en	54	47	0	4	39	4	3	
omen	54	48	0	1	42	5	5	
sics								
en	38	13	0	2	11	0	19	
omen	38	10	0	0	8	2	21	
mistry								
en	45	21	0	3	18	0	17	
omen	45	19	0	1	15	3	24	
logical sci.								
en	178	74	1	6	65	2	98	
omen	178	62	0	4	52	6	103	
chology								
en	38	22	0	1	20	1	8	
omen	38	31	0	1	27	3	2	
ial sci.								
en	68	64	2	8	53	1	1	
omen	68	59	0	6	51	2	4	

percent with faculty appointments is statistically s
smaller than the differences observed for earlier Ph

In mathematics, psychology, and social sciences
are not very different in terms of faculty rank, wit
slightly more favorable distribution by rank among p
largest discrepancies in proportions of men and wome
appointments occur in biosciences and humanities.

Getting on the tenure track

Table 5.3 showed that about 60 percent of the m
Ph.D.s since 1975 had regular faculty appointments a
majority of these are assistant professorships which
tenured positions; most but not all are tenure-track
a junior faculty position is a ladder appointment is
known by the individual at the time he or she is hir
tive data on tenure status in Table 5.4 indicate tha
appointees are nearly twice as likely to be outside

TABLE 5.4 Tenure status of matched pairs of men and
doctorates during the period 1975-1978

	Total academic sample	Total faculty*	Tenure	Tenur trac
Men	674	435	15%	7(
Women	674	377	9%	66

*Assistant, associate, or full professor

teaching is borne out by our data on work activities of the
Ph.D.s but it does not appear to be a serious problem. Before
ling for university setting, there is a slight difference--with
 of 447 women (73 percent) spending more than half of their
 ching, compared with 324 out of 485 men (67 percent). It is
 ting to note that any differences that do exist are not found
 r research universities but in other universities and four-year
  (Table 5.5). In no setting, however, are the matched men and
 ry different with respect to the fraction of time devoted to
 .

.5 Percent time devoted to teaching by type of institution*
    for matched pairs of men and women who earned doctorates
    in the period 1975-1978

	Total academic sample	% Time teaching in present position				Total reporting
		<25%	25-49%	50-74%	≥75%	
titutions						
	682	73	88	161	163	485
	682	60	62	141	184	447
h univ. I						
	176	14	24	46	24	108
	209	15	26	49	33	123
h univ. II						
	77	11	15	27	12	65
	73	6	8	25	·18	57
niv., med sch.						
	303	44	38	61	51	194
	265	33	24	36	54	147

salary in 1979 for women in full-time academic jo
for men by $400 to $3,300 annually, depending on
largest differentials in pay were found in chemis
biological sciences ($2,100). There is no evider
discrimination" in either rank or salary.

TABLE 5.6 Median annual salaries of matched pair
in academe in 1979 who earned doctorat
period 1975-1978

Field of doctorate	All academic positions		Diff
	Men	Women	
All fields	$19,400	$18,500	$
Math	19,300	18,900	
Physics	22,700	21,500	1,
Chemistry	21,500	18,200	3,
Biological sci.	20,500	18,400	2,
Psychology	19,100	18,500	
Social sci.	20,100	19,200	
Languages & lit.	17,400	16,600	
Other humanities	18,800	17,400	1,

NOTE: Includes only matched pairs in which both

COMPARISON OF FACULTY SALARIES AND RANK

In chapters 2 through 5, we examined the career attainment of successive cohorts of men and women who were matched in pairs so that they "started off together" at the doctorate. The pattern of observed differences in attainment persisted through the decades. In this chapter, we try to summarize the differences and to examine the factors that appear to be associated with attainment in academe, as measured by rank and salary. Attention is restricted to members of the matched triads employed in academe in 1979 since this is the only large group from the viewpoint of employment sector, and the factors determining achievement are expected to depend on the sector. All three members of the triad are considered for possible inclusion.

Prediction equations are established to estimate first rank and then salary as a function of the characteristics of the individual. We can then contrast the attainment in rank and in salary for men and women who have similar characteristics and the relative importance of the various characteristics for each sex. Lastly, we estimate what salary a woman would receive if she were paid like a man of similar characteristics.

Some information on the factors related to career attainment is available in chapters 2 through 5 from the direct comparisons of members of the triads in successive cohorts. Further information is available from published studies[1] of the status of men and women in academe. Unfortunately, the data set available to us does not contain all the information desired for all years of Ph.D. Certain demographic data, such as marital status at the time of doctorate, which has been shown to have a differential effect for men and women (positive for men, negative for women), are available starting in 1958. Since it is of interest to investigate the importance of such variables, we restrict the data set to those triads where the Ph.D. was awarded since 1958 and to members of the triad who supplied the needed demographic and employment information. We emphasize that the one woman and two men within each triad match not only on characteristics at the time of

conclusions by these restrictions on the sample. As n[...]
this report, such effects are not expected to be large[...]
had time to examine them in detail.

We also lack information on publications by each [...]
Citation data was desirable, however, the confusion on[...]
individuals in the data bank prevented its use. Inves[...]
proposed matching of our sample cases with the ISI (In[...]
Scientific Information) data files revealed a large pe[...]
multiple names in the Ph.D. group caused by the abbrev[...]
names in the ISI author index (two initials and the la[...]
The matching problem is exacerbated in the case of wom[...]
referencing of names. Funds were not available for th[...]
editing that would permit use of the data.

At first sight, the lack of publication and citat[...]
appears to be a barrier to obtaining good predictions [...]
salary in academe. However, there are two situations [...]
culty seems to arise. Earlier studies [3] indicate that [...]
restricted to faculty in the same or neighboring depar[...]
fields) and also to the same type of institution, then[...]
may be well estimated without additional reliance on t[...]
records. This empirical fact was first noticed for ma[...]
major research universities[4] in a search for efficient [...]
faculty salary. It appears that the explanation lies [...]
pressure applied in selecting and advancing these facu[...]
the same number of years since the doctorate have very[...]
(rank-step) and rather similar publication records (or[...]
be employed in these institutions). Thus, number of y[...]
doctorate is the most important predictor of salary (r[...]
highly correlated publication information does not imp[...]
appreciably.

More recent evidence indicates that if one keeps [...]
homogeneous with respect to both field and type of ins[...]

[2]cf. Chapter 8.

[3]cf. Scott (1977).

[4]Research Universities I according to he Carnegie Cla[...]

) result. A further reason for avoiding use of publication
is the fact that insofar as women have excess difficulties in
publication due to biased refereeing,[7] use of a woman's
tion record will tend to underestimate her rank and salary.

other situation where publications records are not needed to
salary (rank) of faculty is in the many four-year colleges
versities where research is not emphasized.

our first analysis, we have restricted attention to members
triads employed in major research universities in 1979 for
reasons. First, this group of 51 institutions is the largest
r of Ph.D. scientists, engineers, and humanists; second, the
structure is similar in this set of employers, at least within
e major fields; and third, as noted above, salary may be well
ed without additional reliance on publication records provided
or fields are studied separately.

r second set of analyses considers full-time faculty in all
ar colleges and universities. Comparison of the two analyses
es remarkably similar conclusions, differing only in occasional
and suggests that the interpretations are indeed not too
nt on the missing publication information. Nevertheless, we
eel more secure if analyses with publication information (or
roductivity measures) included had been performed.

h these reservations, we now employ regression analysis to
first rank and then salary of male faculty, restricted as to
nd type of institution. Once these equations have been
d, we will use them to predict what rank (salary) a woman
member would receive in the same field and type of institution
were rewarded like a man of similar characteristics. We will

ernandez, "Faculty publications as a stochastic process,"
of Carnegie Commission on Higher Education (forthcoming)
. Simon, Shirley M. Clark, and K. Galway, "The Woman Ph.D.:
t Profile," *Social Problems,* Vol. 15 (1967). pp. 221-236.

an E. Boyer, "College and University Faculty: A Statistical
tion," *ACE Research Reports,* 5 (5), American Council on Educa-
ashington, D.C. 1970.

. Lefkowitz, "Education for Women in a Man's World," *Chronicle*

both sexes combined, with an additive term inserted to portray the effect of sex (the effect of being a woman as contrasted with being a man, all else being constant). This prediction equation will be suitable if the difference in rank (salary) is concentrated in this single additive term (which turns out not to be the case). Lastly, we estimate the prediction equations for rank and for salary for the combined population omitting the sex term. The latter model would be appropriate if sex does not play a role in the determination of rank and salary which, _a fortiori_, is not the case with our data set.

Separate analyses are carried out for the four major fields: 1) mathematics, physical sciences, and engineering, 2) biosciences, 3) psychology and social sciences, and 4) humanities. Recall that we have restricted the population to be analyzed so as to obtain more homogeneous groups in order to improve the validity of the analyses and to clarify the interpretation of the role of sex in the reward system. On the other hand, we are not studying all matched pairs of doctorates. The persons omitted from consideration are more likely to be women than men and will tend to have lower salaries when the reason for removal is unemployment, part-time employment, breaks in employment, and so forth. When the omission is due to employment in another sector than academe, the missing person is more likely to be male and to have a higher salary. Another source of bias is the exclusion of doctorates awarded before 1958, since salary and rank differences tend to be more pronounced for older women. In summary, we can expect to obtain good estimates of the differences attributed to sex for the younger faculty in major research faculties, but expect to underestimate the difference for all matched pairs, especially the older pairs.

Insofar as the regression equations are satisfactory for predicting rank (salary) for any particular group, we can examine and contrast the factors that are important in the prediction. As noted above, the results of the regression analyses can also be used to predict the rank (salary) that a woman should receive if rewarded like a man of similar abilities and experience. If the actual rank (salary) is less than what she would receive if paid like a man, then she has an apparent salary deficit. If the majority of women appear to have a salary deficit, so that their average residual is negative rather than zero (as it must be for men due to the regression analysis), the suggestion is that there may be discrimination against women as individuals or as a class. However, other interpretations could be possible considering the inadequacies of the data set. Moreover, if the regression equation

Rank was coded as: 4 = full professor, 3 = associate professor, 2 = assistant professor, and 1 = instructor. A linear regression equation to predict rank was estimated by the method of least squares. In the first series of analyses, the possible predictor variables were introduced stepwise in the order of their partial correlation with rank, with the variables already introduced held constant. When the squared correlation coefficient R^2, adjusted for sample size, reached its maximum, the insertion of additional predictor variables was terminated. Thus, the details of the linear regression equation were determined by the data themselves. The sample sizes for the individual prediction equations are not large so that the precision of estimating the coefficients in each equation is not high and the estimators of $F*$ and of adjusted R^2 tend to be deflated. Therefore, a comparison of the coefficients is difficult, and might be better achieved if the same set of predictor variables had been used in every equation.

Nonlinear models, in particular, multiplicative models, could hav been investigated also but shortage of time and funds have precluded such studies in this report. Since we have restricted our time interval to 1958-1978 in order to have a fuller set of predictor variables, the consequences of using an additive model versus a multiplicative model are diminished. As indicated in the plots in Chapters 7 and 8, simple linearity is not contradicted especially in the more recent cohorts.

We need to keep in mind that no term measuring standard academic productivity, such as number of research books published and reviewed favorably, has been included due to lack of information. Therefore, the interpretation of the coefficients, especially the less important coefficients, is subject to doubt whenever part of their effect might be absorbed in a measure of productivity.

Tables 6.1 through 6.4 show the factors that predict rank for each of the four major fields. The important predictors are listed in the first column followed by the coefficient to be attached to that predictor, first the ordinary (raw) coefficient to be used in the prediction equation and then the standardized coefficient. The coeffi cients in the equation predicting the ranks of women are listed first, followed by the coefficients in the equation for predicting the ranks

6.1 Predictors of faculty rank at research universities based on matched triads of women who earned Ph.D.s during the period 1958-1978 in the field of mathematics, sciences, and engineering

| | REGRESSION COEFFICIENT, ORDINARY | | | | REGRESSION COEFFICIENT, STANDARDIZED | | | | F-RATIO | | | |
| | | | Combined, with sex term: | | | | Combined, with sex term: | | | | Combined, with sex term: | |
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out
ce doctorate	.039	.122	.083	.079	.242	.747	.497	.476	2.98	243.36**	36.23**	31.57**
TE experience	.058	--	.028	.032	.396	--	.199	.229	9.06**	--	6.02**	7.63**
in med. school	--	--	--	--	--	--	--	--	--	--	--	--
ersen rating, dept.	.118	.031	.050	.054	.186	.045	.073	.079	4.82**	1.02	3.37	3.74
t doctorate	--	-.126	-.132	-.117	--	-.067	-.070	-.062	--	1.99	2.78	2.09
as of 1979	-.305	--	--	--	-.169	--	--	--	3.57	--	--	--
dren under 18	.168	.222	.206	.256	.100	.123	.115	.143	1.21	5.92**	6.76**	10.12**
s from:	--	--	--	--	--	--	--	--	--	--	--	--
arts coll. l	--	--	--	--	--	--	--	--	--	--	--	--
h university	--	--	--	--	--	--	--	--	--	--	--	--
institution	--	--	--	--	--	--	--	--	--	--	--	--
	1.180	1.508	1.514	1.348								
male	--	--	-.310		--	--	-.163		--	--	16.89**	
R^2	.419	.640	.578	.553								
	.386	.633	.569	.545								
cases	94	195	289	289								

| | REGRESSION COEFFICIENT, ORDINARY | | | | REGRESSION COEFFICIENT, STANDARDIZED | | | | F-RATIO | | | | ZERO-ORDER (SIM...) | |
| | | | Combined, with sex term: | | | | Combined, with sex term: | | | | Combined, with sex term: | | | |
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women	Me...
e	.069	.105	.098	.094	.451	.603	.569	.549	11.81⁑	73.34⁑	89.57⁑	75.16⁑	.62	.73
ce	.021	.021	.020	.021	.170	.137	.138	.146	1.63	3.89⁑	5.29⁑	5.49⁑	.58	.66
ool	-.263	-.181	-.197	-.212	-.145	-.097	-.104	--	4.29⁑	6.78⁑	10.07⁑	11.23⁑	-.17	-.09
g	.044	--	--	.027	.074	--	--	.039	1.09	--	--	1.37	.15	--
	-.132	-.068	--	--	-.088	.034	--	--	1.51	0.66	--	--	-.19	.10
18	--	.124	.092	.152	--	.065	.045	.074	--	2.32	1.72	3.51	--	.25
	--	--	--	.092	--	--	--	.053	--	--	--	1.69	--	--
y	--	--	--	--	--	--	--	--	--	--	--	2.41	--	--
n	--	.058	.058	-.142	--	--	.035	-.052	--	--	1.11	--	--	--
-	1.697	1.558	1.684	1.469	--	--	-.169	--	--	--	23.94⁑	--	--	--
	--	--	-.313	--	--	--	--	--						
	.429	.559	.532	.512										
	.405	.551	.526	.504										
tion	126	332	458	458										
	.583	.559	.571	.595										

.05 significance level

Predictors of faculty rank at research universities based on matched triads of men a[nd] women who earned Ph.D.s during the period 1958-1978 in the field of psychology and s[ocial] sciences

| | REGRESSION COEFFICIENT, ORDINARY | | | | REGRESSION COEFFICIENT, STANDARDIZED | | | | F-RATIO | | | | ZERO-ORDER (SI...) | |
	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women	M...
ate ence	.067	.116	.097	.098	.438	.751	.627	.628	11.77∴	233.58∴	61.92∴	61.35∴	.68	.7
	.038	--	.016	.016	.298	--	.119	.124	5.55∴	--	2.24	2.41	.66	--
chool	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ing	--	.051	--	--	--	.073	--	--	--	2.21	--	--	--	.1
te 79 r 18	-.166	.265	--	--	-.097	.105	--	--	1.74	4.21∴	--	--	<.01	.1
	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	--	.228	.140	.134	--	.113	.077	.102	--	4.88∴	3.10	5.93∴	--	.2
l. 1 ity ion	.300	--	.161	.141	.126	--	.056	.049	3.00	--	1.77	1.36	.17	--
	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	1.785	1.310	1.762	1.673										

Predictors of faculty rank at research universities based on matched triads of men a[nd] women who earned Ph.D.s during the period 1958-1978 in the field of humanities

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-ORDER (SIMPLE)	
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:			
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women	Men
te nce	.081 .035	.086 .033	.081 .036	.079 .038	.533 .288	.559 .278	.518 .300	.508 .320	15.44∷ 4.49∷	44.16∷ 10.70∷	54.72∷ 17.85∷	52.59∷ 20.88∷	.78 .75	.79 .73
hool	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
ng	.077	.037	.060	.061	.120	.051	.084	.086	2.05	1.02	4.25∷	4.40∷	.26	.01
e 9 18	-- .293 --	.159 -- --	-- .191 --	-- .210 --	-- .194 --	.087 -- --	-- .109 --	-- .120 --	-- 6.15∷ --	3.12 -- --	-- 6.91∷ --	-- 8.61∷ --	-- .30 --	.12 -- --
.l y on	-- -- -.305	-.135 -- --	-.096 -- --	-.114 -- --	-- -- -.108	-.063 -- --	-.048 -- --	-.057 -- --	-- -- 1.65	1.62 -- --	1.37 -- --	1.96 -- --	-- -- <.01	-.14 -- --
	1.065	1.423	1.303	1.244										
-	--	--	-.119				-.068	--			2.55	--	--	--
	.724	.665	.689	.685										
	.694	.653	.680	.677										
	53	144	197	197										
	.415	.452	.442	.444										

tion

0.05 significance level

predictor variables used are collinear so that neither the [?]
nor the F-ratio has a simple meaning.

The most important predictor variable turns out to be [?]
of years in academe, or a similar weighted measure of the p[?]
time. Without exception, the number of years since the doc[?]
actually possesses the highest correlation (and thus is the [?]
dictor to enter the equation), has the highest standardized [?]
and also the highest F-ratio. However, years since the doc[?]
years FTE (full-time equivalent) experience are highly corr[?]
that the concept of number of years of service is split in [?]
partly absorbed by each of these predictors. The sum of th[?]
coefficients attached to years since doctorate and years FT[?]
estimates the average yearly increase in rank. Without exc[?]
total of these two coefficients for men is larger than that [?]
indicating that men advance more rapidly than women, on the [?]

For men, the second most important predictor out of th[?]
turns out to be the presence of children under 18 years of [?]
coefficient is always positive whenever the term occurs, an[?]
an increase in the predicted rank of between 0.1 and 0.25. [?]
children under 18 has a similar positive contribution to ra[?]
women in MPE fields (mathematics, physical sciences, and er[?]
but does not appear in the other fields. Other variables t[?]
the prediction of rank for most fields include marital stat[?]
time of Ph.D. Being married at receipt of the doctorate ma[?]
negative contribution for women but a positive contribution [?]
with the exception of men in MPE. Married as of 1979 is co[?]
married at time of doctorate so that in most cases only one [?]
predictor variables enters the equations for rank. The pre[?]
the Ph.D.-granting institution often enters, always with a [?]
sign and somewhat more important for women than for men or [?]
sexes combined. The type of college which granted the bach[?]
degree, classified broadly, occasionally plays a small role [?]
doctorates in bioscience, being employed at a medical schoo[?]
makes a negative contribution to rank, indicating that the [?]
structure in medical schools is lower than that in other ir[?]
by about one-fifth of a rank (even more for women).

The predictor variable, sex is female, can enter only [?]
prediction equation computed for both sexes combined and ir[?]

efficients of the prediction equation for women are different
 corresponding equation for men, the equation for the combined
oes not apply and can be considered at most a suggestion.

rs of rank of faculty at four-year colleges and universities

 second set of analyses uses the results of the first analyses
lish a fixed set of predictor variables to be used throughout.
 in order to increase the sample size and extend the investiga-
ond the major research universities, the sample was enlarged to
faculty at all four-year colleges and universities. The number
 members studied in the second analyses is three to four times
the first, but the sample is less homogeneous with rather
t criteria for advancement. Information on publications is
cking but does not play a role in many of these institutions.
less, the goodness of fit is hardly affected, with the adjusted
e changed, sometimes higher and sometimes less; similarly for
mated standard error of prediction.

 results for the second set of analyses are shown in Tables
8 which are to be compared with Tables 6.1 - 6.4. Both years
ctorate and years FTE experience are important. As noted
 the sum of their coefficients is an indication of the average
 in rank per year, and this sum is consistently smaller for
an for men. The depressed scale in the medical schools is
parent. Having children under 18 tends to increase the rank
as it does for women in the MPE fields (mathematics, physical
, and engineering)--in agreement with the pattern for research
ties--but decreases the rank of women in other fields. No other
r variable seems to be consistently important except the effect
e sex in the combined regression equation which is again
.

rs of faculty salaries

culty salaries were estimated by two sets of analyses--first,
r research universities and secondly, all four-year colleges
versities--in parallel with the studies of rank. The important
r variables turned out to be much the same, except that several
al predictors, some of which are not surprising, affect salary.

Predictors of faculty rank at four-year colleges or universities based on matched of men and women who earned Ph.D.s during the period 1958-1978 in the field of mathematics, physical sciences, and engineering

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-ORDER (SIMP...	
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:			
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women	Men
orate ience	.068	.083	.077	.075	.426	.530	.484	.471	33.22*	99.92*	132.94*	123.20*	.68	.77
	.037	.031	.034	.036	.301	.241	.267	.276	15.69*	21.24*	40.92*	42.84*	.66	.73
ge 1, other school	.021	.051	.035	.026	.012	.028	.019	.014	0.08	1.10	0.73	0.40	.13	.00
	-.090	.014	-.018	-.006	-.042	.008	-.009	-.003	1.04	0.08	0.17	0.02	-.13	-.05
school	-.524	-.435	-.483	-.528	-.153	-.085	-.113	-.123	15.26*	11.94*	29.50*	34.58*	-.16	-.07
ting	.005	-.013	-.110	-.009	.001	-.022	-.019	-.014	0.00	0.71	0.75	0.43	-.06	-.06
ate 979 ler 18	.056	.008	.026	.035	.033	.005	.015	.020	0.50	0.03	0.37	0.67	-.05	.09
	-.075	.089	.013	.034	-.043	.039	.007	.017	0.83	1.76	0.07	0.45	-.06	.24
	.053	.121	.101	.149	.031	.068	.059	.089	0.49	5.43*	5.58*	12.56*	.05	.29
oll. 1 sity tion	.057	-.023	-.001	-.037	.029	-.009	≈.000	-.016	0.41	0.12	0.00	0.52	-.02	-.02
	.067	-.075	-.030	-.029	.039	-.046	-.018	-.017	0.71	2.86	0.60	0.55	-.06	-.11
	.095	.076	.075	.060	.026	.022	.021	.017	0.42	0.73	0.98	0.62	-.02	.03
	1.585	1.659	1.732	1.615										

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-ORDER CORRELATION (SIMPLE r)		
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:				
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women	Men	Combined
	.047	.095	.076	.074	.303	.579	.469	.454	15.26**	115.99**	118.02**	107.88**	.61	.72	.68
	.045	.021	.032	.034	.400	.164	.257	.270	26.74**	9.30**	35.91**	38.69**	.65	.66	.64
	-.164	.032	-.004	-.042	-.088	.011	-.002	-.018	2.49	0.13	≈0.00	0.41	-.03	.01	-.04
	-.054	.065	.031	.044	-.022	.030	.014	.019	0.18	0.83	0.24	0.47	.06	.03	.05
	-.318	-.101	-.155	-.152	-.198	-.063	-.095	-.093	12.61**	3.24	10.54**	9.88**	-.19	-.10	-.12
	.007	-.003	.003	.007	.011	-.004	.005	.010	0.05	0.02	0.03	0.14	.02	.03	.04
	-.005	-.099	.044	.068	-.003	.048	.025	.038	0.00	2.21	0.69	1.60	-.09	.10	.08
	.145	.065	.060	.112	.093	.026	.031	.057	2.35	0.65	1.00	3.47	-.06	.11	.10
	-.207	.106	.003	.559	-.127	.056	.002	.033	5.09**	2.31	0.00	1.15	-.12	.18	.14
	-.063	-.098	-.094	-.157	-.034	-.031	-.037	-.063	0.41	1.06	1.94	5.50**	-.10	-.08	-.12
	.010	.049	.044	.046	-.006	.030	.027	.028	0.02	0.90	0.97	1.06	-.03	.09	.07
	-.135	-.104	-.108	-.080	-.028	-.032	-.029	-.022	0.36	1.05	1.33	0.70	-.03	-.01	.00
	1.772	1.510	1.708	1.543											
			-.239				-.137				23.62**				-.17
	.497	.555	.531	.517											
	.473	.546	.523	.510											
	.256	.553	.809	.809											
	.568	.541	.553	.566											

...ificance level

6.7 Predictors of faculty rank at four-year colleges or universities based on match of men and women who earned Ph.D.s during the period 1958-1978 in the field of psychology and social sciences

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-
	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women
e doctorate	.085	.095	.092	.091	.586	.633	.617	.612	68.56*	181.08*	248.08*	243.52*	.72
experience	.018	.017	.013	.018	.153	.135	.146	.152	4.63*	8.28*	13.89	15.07*	.66
college	-.069	-.025	-.043	-.045	-.035	-.012	-.021	-.022	0.74	0.22	0.92	1.01	-.09
univ. 1, other	-.059	-.036	-.011	.008	-.030	.018	.006	.004	0.53	0.44	0.06	0.03	-.05
dical school / school	-.363	-.539	-.472	-.476	-.110	-.157	-.139	-.140	8.10*	38.00*	41.96*	42.58*	-.11
sen rating dept.	-.015	-.029	-.026	-.024	-.026	-.049	-.043	-.041	0.44	3.47	3.39*	3.46	⋆.00
doctorate	-.017	.018	.001	.017	-.010	.008	⋆.000	.009	0.05	0.08	0.00	0.13	-.05
s of 1979	.064	.076	-.054	.068	.039	.034	.028	.035	0.70	1.36	1.22	1.94	-.02
n under 18	-.072	.222	-.115	.132	-.043	.125	.069	.079	1.04	20.96**	3.25*	11.17*	-.10
from: rts coll. 1	-.014	-.040	-.041	-.063	-.006	-.014	-.016	-.024	0.02	0.28	0.50	1.16	.01
university	.006	.020	.006	-.001	.004	.012	.004	-.001	0.01	0.19	0.03	0.00	.03
nstitution	-.111	.153	.023	.017	-.029	.038	.007	.004	0.53	2.24	0.11	0.04	-.08
	2.001	1.834	1.965	1.898							6.25*		
		-.098	-.098				-.057						

6.8 Predictors of faculty rank at four-year colleges or universities based on match of men and women who earned Ph.D.s during the period 1958-1978 in the field of humanities

| | REGRESSION COEFFICIENT, ORDINARY | | | | REGRESSION COEFFICIENT, STANDARDIZED | | | | F-RATIO | | | | ZERO |
| | | | Combined, with sex term: | | | | Combined, with sex term: | | | | Combined, with sex term: | | |
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women
ce doctorate	.063	.070	.068	.067	.378	.447	.421	.419	47.92*	134.27*	182.51*	179.55*	.65
TE experience	.041	.039	.040	.041	.366	.344	.354	.359	42.22*	78.20*	127.04*	130.40*	.64
ar college	-.093	.066	.009	.009	-.054	.039	.005	.005	2.01	2.22	0.06	0.06	≈.00
h univ. 1, other medical school school)	-.247	-.055	-.117	-.103	-.102	-.026	-.054	-.050	6.76*	1.00	5.94*	5.08*	-.15
	.667	-.321	.034	.034	.041	-.014	.002	.002	1.24	0.34	0.01	0.01	.01
ersen rating dept.	.057	-.020	.003	.003	.086	-.030	.004	.004	4.83*	1.44	0.04	0.03	.07
t doctorate	.089	.119	.105	.119	.054	.062	.060	.068	1.38	3.92*	4.92*	6.40*	-.13
ds of 1979	-.134	.017	-.035	-.025	-.081	.009	-.020	-.014	3.17	0.08	0.54	0.28	-.13
ren under 18	-.038	.094	.057	.074	-.022	.056	.034	.045	0.27	4.08*	2.06	3.56	-.10
from: rts coll. 1	.083	-.037	≈.000	-.018	.042	-.015	≈.000	-.008	0.90	0.34	0.00	0.12	-.03
university	-.089	-.053	-.018	-.022	-.053	-.032	-.011	-.013	1.45	1.38	0.22	0.31	-.03
institution	-.019	-.094	-.091	-.095	-.005	-.028	-.026	-.027	0.02	1.23	1.50	1.60	-.02
le	1.583	1.746	1.763	1.702									
- - - - -			-.102					-.059			7.32*		
R²	.508	.562	.536	.533									
	.492	.555	.531	.528									
cases,	385	767	1152	1152									
of prediction	.588	.542	.561	.563									

*, nominal 0.05 significance level

As in the prediction of rank, the total of the
terms is always the most important part of the predi
average year's increase in salary, approximately the
partial coefficients, is always less for women than
term, have children under eighteen, often appears ar
the neighborhood of a $1,000 to $2,000 increase in s
the effect is generally not statistically significar
is for women humanists at major research universitie
tive effect of having children is striking--a $5,000
annual salary.

The predictor variables, primary activity is ac
primary activity is teaching, often enter the predic
salary, whereas they did not appear in the predictic
usual explanation is that the term "administrator" i
deans as well as deans, and thus cuts across all rar
is that administrators receive an additional stipenc
$2,000 to $6,000 per year, depending on the field.
enters a prediction equation, its coefficient is neg
its reward in competition with research and administ
teaching term never enters the stepwise prediction e
salary of women faculty in major research universiti
is entered as one of the fixed predictors in the sec
its coefficient is never significantly different fro
even though this term is often significant for men a
group.

Employment in a medical school has a positive e
whereas its effect on rank is negative. This appear
tion of the higher salary scale at medical schools.
the faculty member's Ph.D.-granting department, as n
Roose-Andersen rating, tends to be positively relate
not significant. Receiving an undergraduate degree
university has a negative effect in most cases, espe
equation for women. However, none of these terms is
in the prediction. We find that being married usual
effect on the salary of a woman, but a positive effe
of a man. The term, sex is female, can occur only i
predicting salary for both sexes combined. Its cont
negative and large, especially in the research unive
ranges from -$1,200 in the humanities to -$4,000 in

Table rotated 90°. Title:

...ors of faculty salaries at research universities based on matched triads of men ...men who earned Ph.D.s during the period 1958-1978 in the field of mathematics, ...al sciences, and engineering

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-ORDER CORRELATION (SIMPLE r)		
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:				
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women	Men	Combined
	--	843	371	348	--	.670	.292	.273	--	145.49*	7.79*	6.77*	--	.70	.63
	730	--	355	383	.616	--	.338	.365	46.77*	--	10.65*	12.39*	.58	--	.63
	-2592	2940	2002	2198	-.102	.135	.087	.095	1.10	6.22*	3.04	3.63	-.04	.18	.13
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	895	--	408	453	.189	--	.078	.087	3.62	--	2.45	3.01	.10	--	.07
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	-3436	1625	--	--	-.257	.091	--	--	6.58*	2.65	--	--	-.09	.30	--
	2018	--	798	1055	.160	--	.059	.078	2.63	--	1.36	2.42	.07	--	.26
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	-2992	1790	--	--	-.198	.078	--	--	2.96	1.76	--	--	-.02	-.03	-.001
	-3407	1966	657	768	-.274	.145	.049	.057	5.64*	5.26*	1.02	1.38	-.11	-.03	--
	-3824	2222	--	--	-.150	.095	--	--	2.20	2.60	--	--	-.05	.09	--
	17237	14994	15986	15023	--	--	--	--	--	--	--	--	--	--	--
	--	--	-1551	--	--	--	-.107	--	--	--	4.76*	--	--	--	-.21
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	.455	.529	.451	.441											
	.393	.512	.436	.427											
	79	175	254	254											
	4872	4733	5074	5112											

...icance level

to: Employed in public university

.10 Predictors of faculty salaries at research universities based on matched triad[s] and women who earned Ph.D.s during the period 1958-1978 in the field of biosci...

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-OR[DER]
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:		
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women
doctorate	949	641	814	798	.676	.350	.456	.447	16.24*	13.43*	121.55*	111.22*	.51
experience	-256	195	--	--	-.223	.122	--	--	1.79	1.67	--	--	.39
...ivity is:	4141	4906	4056	3384	.185	.168	.143	.140	3.68	12.06*	11.97*	10.96*	.21
...ation	--	-1968	-1375	-1636	--	-.090	-.068	-.081	--	3.31	2.68	3.59	--
med. school+	--	3199	2461	(-2526)	--	.163	.126	(-.117)	--	11.50*	9.72*	(7.90)*	--
...sen rating	612	490	5097	557	.116	.065	.072	.078	1.96	1.79	3.07	3.55	.14
dept.													
doctorate	-1561	1589	--	--	-.115	.076	--	--	1.86	2.05	--	--	-.14
...s of 1979	--	--	--	1616	--	--	--	.076	--	--	--	2.47	--
...en under 18	--	1423	1495	2034	--	.071	.084	.114	--	1.69	3.69	5.22*	--
...from:													
...ts coll. I	--	--	--	-1663	--	--	--	-.057	--	--	--	1.88	--
...university	--	--	--	--	--	--	--	--	--	--	--	--	--
...stitution	-5345	--	-1630	-1406	-.130	--	-.049	-.042	1.83	--	1.48	1.04	.06
...	16591	14405	16515	16391									
...le	--	--	-4019	--	-.203						22.20*		--
	.324	.331	.349	.320									
	.282	.312	.277	.206									

social science

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:		
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women
...ce doctorate	--	705	532	536	--	.424	.344	.347	--	13.07*	14.52*	14.06*	--
...TE experience	707	376	426	435	.713	.262	.326	.333	88.28*	4.91*	12.68*	12.60*	.68
...ctivity is:													
...tration	--	2448	1915	1841	--	.102	.085	.082	--	2.32	2.62	2.30	--
...g	--	-2000	-1653	-1616	--	-.105	-.094	-.091	--	2.57	3.16	2.86	--
...in med. school+	(-1774)	(-1696)	(-1774)	(-1509)	(-.130)	(-.088)	(-.100)	(-.085)	(2.87)	(2.30)	(4.29)*	(2.98)	(-.05)
...ersen rating . dept.	-478	427	--	--	-.086	.057	--	--	1.26	0.97	--	--	-.02
...t doctorate as of 1979	-1641	--	-1946	-1264	-.119	--	-.099	-.064	2.48	--	4.29*	1.80	-.07
...dren under 18	--	--	1573	2343	--	.073	.087	.129	--	--	3.22	7.24*	--
...s from:													
...arts coll. I	--	2187	--	--	--	.057	--	--	--	1.00	--	--	--
...h university	1760	--	--	--	.128	--	--	--	2.81	--	--	--	.09
...institution	--	--	-2094	-2299	--	--	-.057	-.062	--	--	1.56	1.79	--
...psychology	--	--	-1103	-1102	--	--	-.062	-.062	--	--	1.53	1.44	--
‑ ‑ ‑ ‑ ‑	20465	16613	21675	19224									
...ale			-3126	--			-.171				12.79*	--	--
R²	.515	.546	.540	.515									
	.487	.520	.520	.496									
cases	92	152	244	244									
...r of prediction	4900	6600	6100	6300									

*, nominal 0.05 significance level

...in parentheses refer to: Employed in public university

Predictors of faculty salaries at research universities based on matched triad and women who earned Ph.D.s during the period 1958-1978 in the field of humani...

| | REGRESSION COEFFICIENT, ORDINARY | | | | REGRESSION COEFFICIENT, STANDARDIZED | | | | F-RATIO | | | | ZERO-O... |
| | | | Combined, with sex term: | | | | Combined, with sex term: | | | | Combined, with sex term: | | |
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	Women
doctorate	792	390	544	530	.597	.279	.390	.380	40.28*	9.21*	23.23*	22.01*	.71
experience	--	403	235	259	--	.378	.222	.244	--	16.84*	7.37*	9.10*	--
ivity is:	4479	5891	6125	6004	.218	.271	.280	.274	4.94*	18.41*	24.82*	23.75*	.51
tion	--	-3062	-2171	-2236	--	-.201	-.140	-.145	--	10.36*	6.41*	6.76*	--
med. school+	(2713)	--	--	--	(.205)	--	--	--	(4.75)*	--	--	--	(.21)
sen rating dept.	-1411	596	--	--	-.257	.092	--	--	5.73*	3.04	--	--	-.18
doctorate	1689	1113	--	--	.129	.067	--	--	1.45	1.20	--	--	-.15
of 1979	4089	1393	2111	2234	.315	.083	.135	.143	11.06*	1.88	7.40*	8.32*	.31
en under 18	-5136	--	-850	-703	-.395	--	-.061	-.050	15.23*	--	1.48	1.02	-.20
from: rts coll. 1	1511	--	--	--	.109	--	--	--	1.75	--	--	--	.01
university	--	--	--	--	--	--	--	--	--	--	--	--	--
nstitution	-4867	-1988	-2042	-2131	-.188	-.067	-.070	-.073	4.83*	1.62	2.28	2.47	-.02
- - -	16738	12792	16001	15441									
le	--	--	--	-1185	--	--	--	-.074	--	--	--	2.42	--
ases	.790 .737	.667 .646	.642 .625	.637 .622									
	46	138	184	184									
of prediction	3300	4200	4300	4300									

* nominal 0.05 significance level

+ parentheses refer to: Employed in public university

...triads of me... and a woman who earned Ph.D.s during the period 1958-1978 in the
mathematics, <u>physical sciences, and engineering</u>

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZERO-
	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women
...e doctorate	356	607	488	477	.308	.431	.394	.385	12.47*	63.89*	66.66*	63.60*	.57
...TE experience	286	163	237	242	.313	.155	.234	.239	12.34*	6.88*	23.97*	24.32*	.53
...tivity:	566	3392	2836	3000	.022	.156	.123	.131	0.20	23.10*	21.34*	23.91*	.10
...ration	-1113	-1311	-1262	-1196	-.087	-.094	-.092	-.087	2.73	7.88*	10.32*	9.68*	-.12
...ur college	-3137	-1732	-2266	-2302	-.245	-.120	-.162	-.164	22.73*	14.52*	36.83*	37.81*	-.22
...univ. 1, other	-216	814	511	583	-.014	.055	-.034	.039	0.08	3.15	1.71	2.22	≈.00
...medical school / school	-67	1670	899	759	-.003	.042	.027	.023	<0.01	2.06	1.15	0.82	.02
...institution	1219	1492	1454	1476	.097	.106	.107	.108	3.81	13.53*	18.47*	18.89*	.11
...ersen rating dept.	262	182	192	211	.063	.040	.043	.047	1.77	1.75	2.93	3.49	.05
...doctorate	591	910	664	682	.049	.063	.049	.051	0.75	3.86*	3.10	3.25	.01
...as of 1979	-1024	647	-122	10	-.083	.035	-.008	.001	2.17	1.12	0.07	0.00	.01
...ren under 18	944	478	702	948	.077	.033	.054	.073	2.22	1.01	3.49	6.66*	.13
...from: / arts coll, 1	-640	-55	-317	-487	-.045	-.003	-.018	-.028	0.70	0.01	0.47	1.13	-.04
...university	113	813	564	570	.099	.062	.044	.044	0.03	4.06*	2.68	2.72	-.01
...institution	-354	1137	619	534	-.014	.041	.023	.019	0.09	1.98	0.86	0.64	≈.00
	16649	14257	15671	15017									
...ale		-960			-.071						8.14*		
...2	.430	.562	.519	.515									
	.402	.552	.511	.507									
cases	320	614	934	934									
...of prediction	4638	4355	4470	4488									

* nominal 0.05 significance level

Predictors of faculty salaries at four-year colleges or universities based on triads of men and women who earned Ph.D.s during the period 1958-1978 in t biosciences

	REGRESSION COEFFICIENT, ORDINARY		Combined, with sex term:		REGRESSION COEFFICIENT, STANDARDIZED		Combined, with sex term:		F-RATIO		Combined, with sex term:	
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out
s since doctorate	590	597	610	587	.484	.353	.380	.366	28.96*	28.66*	56.18*	50.36*
ears FTE experience	46	145	106	121	.051	.108	.086	.097	0.33	2.63	2.86	3.61
nary activity:												
ministration	2577	4567	3882	3804	.113	.168	.144	.141	3.64	20.12*	22.09*	20.66*
eaching	-713	-1512	-1214	-1475	-.057	-.090	-.076	-.093	0.76	4.28*	4.61*	6.69*
loyer:												
our-year college	-2220	-1976	-1639	-1913	-.152	-.070	-.071	-.083	5.61*	3.18	4.60*	6.14*
search univ. 1, other than medical school	481	1436	1089	1215	.024	.065	.049	.054	0.17	2.51	2.19	2.66
dical school	2406	4699	3979	4051	.189	.283	.248	.252	4.77*	21.11*	25.72*	25.96*
blic institution	1782	106	606	715	.144	.006	.038	.045	3.76	0.01	0.80	1.09
se-Andersen rating Ph.D. dept.	328	143	241	279	.063	.021	.037	.043	1.31	0.33	1.55	2.02
ried at doctorate	-998	1557	487	717	-.081	.074	.028	.041	1.38	3.59	0.63	1.34
arried as of 1979	764	500	320	933	.062	.019	.017	.049	0.82	0.25	0.22	1.88
children under 18	140	1029	756	1360	.011	.054	.046	.083	0.03	1.70	1.58	5.23*
helor's from: iberal arts coll. 1	-342	161	-321	-1026	-.023	.005	-.013	-.041	0.15	0.02	0.17	1.78
search university	-64	293	149	186	-.005	.018	.009	.012	0.01	0.21	0.09	0.13
oreign institution	-2104	-445	-387	-634	-.059	-.013	-.025	-.018	1.13	0.12	0.71	0.36
stant	15071	14806	16205	14437								

triads of men and w m who ear ed Ph.D.s dur ng t e pe iod 1958-1976 in the ...al
psychology and social sciences

| | REGRESSION COEFFICIENT, ORDINARY | | | | REGRESSION COEFFICIENT, STANDARDIZED | | | | F-RATIO | | | | ZERO-ORDER C (SIMPLE) | |
	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women	Men	Combined, with sex term: in	out	Women	Men
ate ence	362 / 335	774 / 126	631 / 205	624 / 213	.308 / .349	.534 / .105	.463 / .182	.458 / .190	15.52** / 19.44**	103.54** / 3.99**	115.20** / 17.53**	111.04** / 18.82**	.64 / .64	.67 / .58
	2033 / -186	3473 / -916	2850 / -974	2877 / -810	.106 / -.013	.160 / -.055	.136 / -.054	.137 / -.050	4.14* / 0.06	19.23** / 2.11	20.77** / 3.24	20.85** / 2.74	.21 / -.09	.35 / -.32
e, other chool	-2323 / 962	-1594 / 2093	-1796 / 1844	-1816 / 1789	-.143 / .060	-.082 / .107	-.097 / .100	-.098 / .097	10.29** / 1.72	7.60** / 12.53**	15.60** / 15.65**	15.72** / 14.52**	-.27 / .08	-.16 / .13
on	1943 / 1121	6991 / 1389	5103 / 1287	5135 / 1360	.069 / .078	.207 / .081	.159 / .079	.160 / .083	2.16 / 3.08	43.57** / 7.05**	37.17** / 9.94**	37.08** / 10.94**	.07 / .07	.16 / .00
ing	240	-101	-9	19	.049	-.018	-.002	.003	1.26	0.38	0.01	0.02	.10	.09
ate 179 er 18	604 / -1459 / 859	1200 / -90 / 781	857 / -791 / 908	1118 / -566 / 1146	.044 / -.106 / .062	.056 / -.004 / .046	.049 / -.045 / .059	.064 / -.032 / .075	0.32 / 4.66** / 1.96	2.84 / 0.02 / 2.32	2.96 / 2.56 / 5.11**	5.04** / 1.31 / 8.22**	-.02 / -.09 / -.01	.10 / .04 / .12
1. 1 ity ion	1310 / 550 / -183	1822 / 72 / 401	1238 / 61 / -52	836 / -58 / -283	.073 / .040 / -.006	.062 / .005 / .010	.051 / .004 / -.001	.035 / -.004 / -.008	2.30 / 0.64 / 0.02	4.44** / 0.02 / 0.12	4.14** / 0.02 / <-0.01	1.92 / 0.02 / 0.10	.05 / .14 / -.09	.03 / .09 / -.01
- -	15648	14996	16311	15175			-.095				14.61**			
			-1520											
	.519 / .494 / .309	.567 / .556 / .587	.541 / .533 / .896	.534 / .526 / .896										
liction	4835	5151	5175	5214										

0.05 significance level

LE 6.16 Predictors of faculty salaries at four-year colleges or universities based o...
triads of men and women who earned Ph.D.s during the period 1958-1978 in th...
humanities

	REGRESSION COEFFICIENT, ORDINARY				REGRESSION COEFFICIENT, STANDARDIZED				F-RATIO				ZE...
			Combined, with sex term:				Combined, with sex term:				Combined, with sex term:		Wo...
	Women	Men	in	out	Women	Men	in	out	Women	Men	in	out	
...since doctorate	482	516	510	506	.387	.396	.396	.392	37.50*	87.52*	129.40*	127.18*	
...s FTE experience	180	229	209	213	.214	.247	.232	.237	10.79*	33.47*	43.49*	45.49*	
...y activity:													
...nistration	3749	1731	2192	2187	.173	.078	.099	.099	9.60*	4.56*	10.67*	10.59*	
...hing	-803	-3091	-2432	-2419	-.050	-.194	-.146	-.146	0.82	25.22*	23.24*	22.93*	
...er:													
...-year college	-1962	-896	-1255	-1250	-.151	-.063	-.091	-.091	12.22*	4.58*	14.14*	14.00*	
...arch univ. I, other	-1155	302	-118	-48	-.064	.018	-.007	-.003	2.10	0.37	0.03	0.01	
...an medical school	12322	--	11346	10966	.108	--	.053	.052	6.66*	--	5.60*	5.23*	
...cal school	2646	1234	1648	1613	.192	.087	.117	.114	21.06*	9.73*	25.83*	24.73*	
...ic institution													
...Andersen rating ...h.O. dept.	394	251	301	300	.079	.047	.057	.057	3.27	2.83	5.98*	5.94*	
...d at doctorate	1367	630	976	1068	-.110	-.039	.070	.076	4.73*	1.27	5.46*	6.59*	
...ied as of 1979	-305	645	262	349	-.025	-.039	.018	.024	0.23	1.28	0.38	0.69	
...hildren under 18	-415	179	-15	91	-.032	.013	-.001	.007	0.46	0.17	0.00	0.07	
...or's from:													
...ral arts coll. I	657	-651	-173	-300	.045	-.032	-.010	-.017	0.79	1.25	0.15	0.45	
...arch university	409	168	191	161	.032	.012	.014	.012	0.42	0.17	0.32	0.22	
...ign institution	1090	-385	55	19	.037	-.014	.002	.001	0.76	0.24	0.01	≈0.00	
...nt	12543	15250	14830	14447									
	-680						-.048					3.99*	

those for men shows similarities indicating that a large
e lower salaries for women is closely associated with the
s for women. We thus conclude that rank cannot be used as a
for salary, since rank is itself influenced by gender. This
d was) verified by computing the predicted salary equations
included as a predictor. As anticipated, rank tightens the
but also distorts it. Due to the collinearity between rank
predictors, all of the coefficients in the prediction equa-
affected. Since some of the differences between men's and
laries are absorbed by the term in rank, the resulting
n the salary of women is less.

"opposite-sex equations"

rimary reason for constructing the prediction for rank and
is to indicate what the women in a triad sample would be
ey were men of similar ability and occupation. We now com-
by case, the actual salary of each woman in the sample with
ted salary that she would receive if she were a man with the
cteristics. The difference between the actual salary and
ted salary is the residual. A negative residual indicates
t deficit in her salary. A positive residual indicates an
xcess. We expect that some women will have a deficit, while
l have an excess. The distribution of these residuals is of
Will the indications of deficit and excess tend to cancel
at the average residual is zero or close to zero, as is the
men?

esults of the use of opposite-sex equations for our sample
luals significantly different from zero, as summarized in
. The mean residuals are more negative for the women faculty
research universities than in universities and colleges as a
e largest deficits appear to be in the biosciences in both
alyses. For the 107 women bioscientists in major research
es whom we studied, the total deficit amounts to nearly
for an average differential of -$3,600 annually. These
s persist year after year, and tend to become larger as the
years in academe increases.

ndicated deficits are largest for those women ten or more
the doctorate, that is, the pre-1970 Ph.D.s. As shown in

Type of institution	Field of Ph.D. (1958-1978 Ph.D.s)	No. of women in sample	Sum of residual
Major research universities	Mathematics, physical sciences, engineering	79	- $132,562
	Biosciences	107	- $387,233
	Psychology and social sciences	92	- $260,167
	Humanities	46	- $ 28,764
All 4-year colleges and universities	Mathematics, physical sciences, engineering	320	- $261,760
	Biosciences	228	- $441,864
	Psychology and social sciences	309	- $423,948
	Humanities	335	- $170,012

Years Since Doctorate
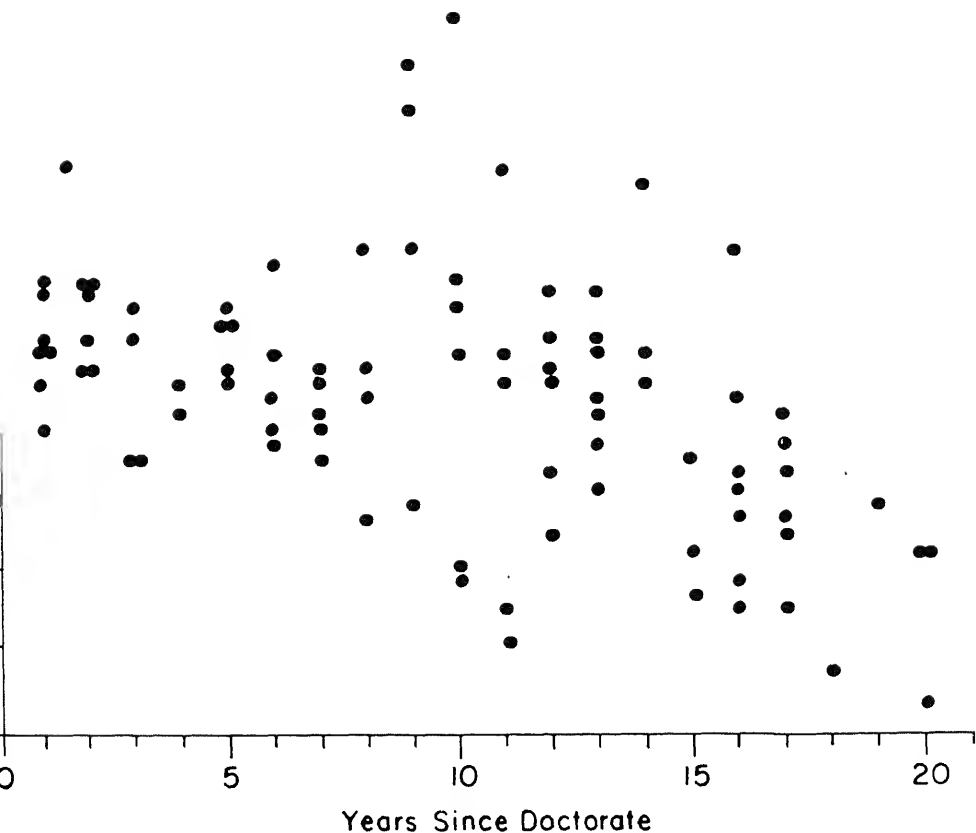
Distribution of salary residuals of faculty women who obtained
Ph.D. 1958-1978 and are in triad sample employed full-time at
major research university in psychology or social sciences, by

four fields and for successive five year periods since the [...]
the doctorate. The shape of the distribution is roughly the [...]
every field, ignoring the irregularities due to small sample[...]
residuals are fairly well centered on zero for the newest gr[...]
women faculty; they shift toward the negative for the group [...]
who obtained the Ph.D. between six and ten years ago, and sh[...]
more for the older women. The indications from the regress[...]
and from the cohort comparisons, as well as from other stud[...]
that the distribution of the residuals will be even more neg[...]
those women who obtained the doctorate more than 20 years ag[...]
continues to shift towards deficit with each successive coho[...]

How should these results be interpreted? We note syste[...]
patterns of deficit in rank and in salary of women faculty [...]
major research universities and in the selection from all fo[...]
colleges and universities. The deficits tend to be double i[...]
research universities, and also to be more striking for the [...]
cohorts even though we are omitting anyone not employed full[...]
1979 or with appreciable breaks in employment. One interpre[...]
discrimination against women as a class or as individuals.

· But discrimination is not proven by the results of the [...]
especially because there are omissions in the possible predi[...]
variables, in particular, measures of productivity. But, as[...]
earlier, women tend to publish as much and more than men in [...]
field in the same kind of institution, so productivity recor[...]
very unlikely to change the comparison.

Within-pair salary differences

The triad of matched doctorates offers the possibility [...]
studying the details in salary differences between men and w[...]
However, when we restrict attention to those members of the [...]
had full-time employment in major research universities and [...]
all the needed demographic and salary information, and then [...]
those triads which have the woman and at least one man satis[...]
the requirements, we find that the sample size has decreased[...]
rapidly--only 66 within-pair comparisons remain! In order t[...]
large enough sample to perform a reliable analysis, some of [...]
restrictions on the matching must be removed. For example, [...]
the employment location to all four-year colleges and univer[...]
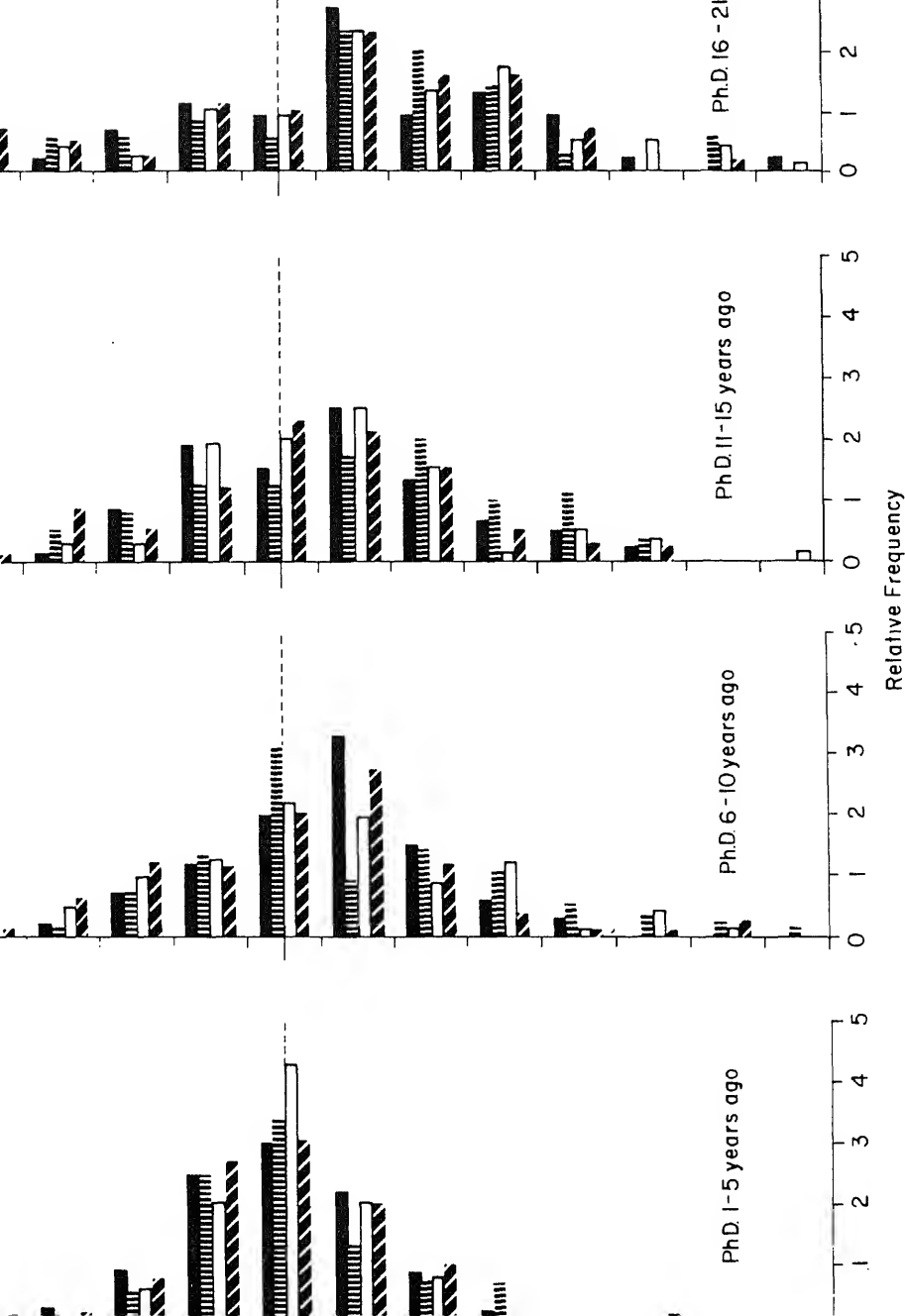
Fig. 2 Distribution of salary residuals of faculty women who obtained Ph.D. 1958-1978 and triad sample employed full-time in 4-year college or university, by field and college doctorate. (Residual is actual 1979 salary minus predicted salary for man with characteristics.)

Relative Frequency

Ph.D. 1-5 years ago

Ph.D. 6-10 years ago

Ph.D. 11-15 years ago

Ph.D. 16-2(

possible but not so important index variables corresponding to:
children under 18, married at time of doctorate, baccalaureate f
liberal arts college 1, and primary activity is administration.
each case, the corresponding index should be defined as the numb
times the man answered "yes" plus the number of times the woman
answered "yes." For example, if in a matched pair neither the m
the woman has children under 18 then the index for this pair has
0 as its first component. If one or the other but not both has
under 18 the index has value 1, and if both have children the va
the index component for this pair is 2. This definition reflect
tendency for these variables to have a negative effect on the sa
of women yet a positive effect for men.

It would be interesting to fit such a regression equation t
salary differences in matched pairs corresponding to cohorts who
received the doctorate during the same time period, as was done
the direct comparisons. The various employment requirements cou
successively relaxed so that a pattern of the differences would
going from matched employment to no restriction on employment.

CHAPTER 7

CONCLUSIONS

ous studies of male and female faculty have found wide sex
s in academic rank and pay. It is often suggested that these
s are due to: a) the greater proportions of women among
D.s, with more of them accordingly holding junior positions;
ferent field distributions of men and women Ph.D.s; c) the
onstraints on career mobility faced by married women; and
ater likelihood that women have interrupted their careers
bearing and child-rearing, thereby losing years of
.

und that such explanations do not agree with our findings.
s in rank and salary remain after matching. Women Ph.D.s
kely to drop out of the labor force even if they have
Only 10 percent of the women with young children do so.
relatively few women doctorates--less than half--have
Unmarried women or those without children do not fare any
faculty promotions than married women with children.

arly, there are no indications that sex differences are due
mobility of women doctorates. Among the sample of junior
o were surveyed in 1975 and again in 1979, the women were
ore likely than the men to have moved to a new institution,
his need not entail a geographic move.

ll, the men and women in the matched sample were equally
be found in highly rated departments, with a greater propor-
n so employed among pre-1970 Ph.D.s, but a greater percentage

sex differences for matched pairs in academe. As shown
the discrepancies in the type of position persist for t
cohorts: fewer women than men obtain faculty positions
those who are in academe, and for those who do, the adv
rank continues to lag for women. The median 1979 sala
7.1) of the women in matched pairs continues to be lowe
men although the percentage difference is somewhat less
younger cohorts. Since the sex differences increase in
as the years go by, we could ascribe the somewhat smal
salary differential in the recent cohorts just to the
younger ages of its members. The salary deficit for wo
the 1975-1978 cohort is 5 percent overall, as it is fo
cohort.

We emphasize that these findings refer to possible
sex discrimination in career outcomes of women in our s
matched triads of Ph.D.s who hold academic positions.
the career utilization of the much larger group of wome
engineering, and humanities who do not have the Ph.D. o
to find and retain suitable academic appointments or in
positions in 1979 are not addressed in this report, due
on time and funds.
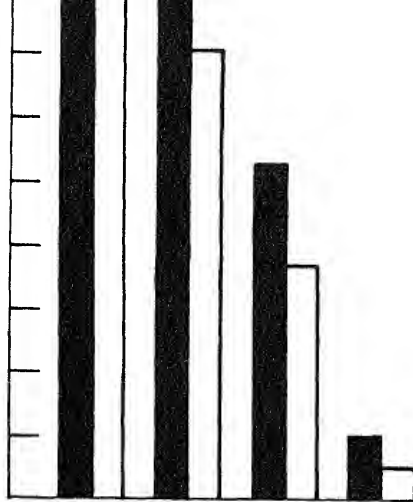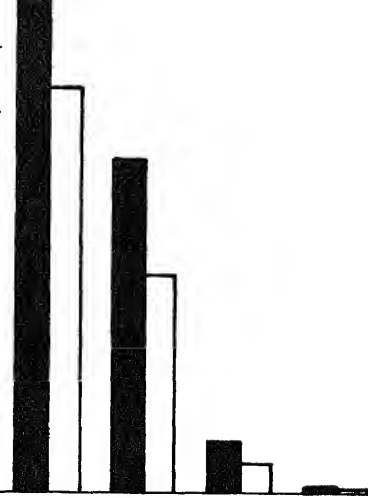
Assistant Professor or Higher
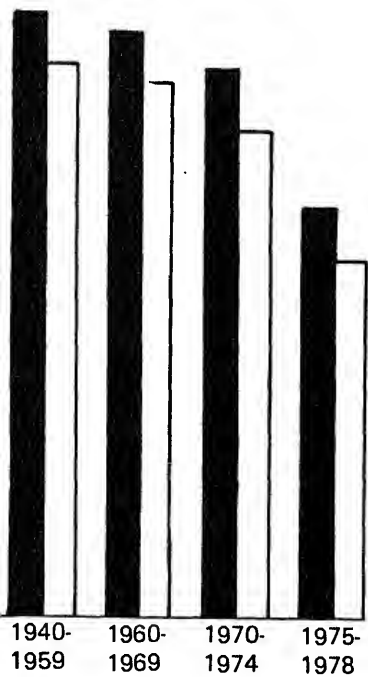
Instructor or Higher

| 1940-1959 | 1960-1969 | 1970-1974 | 1975-1978 |
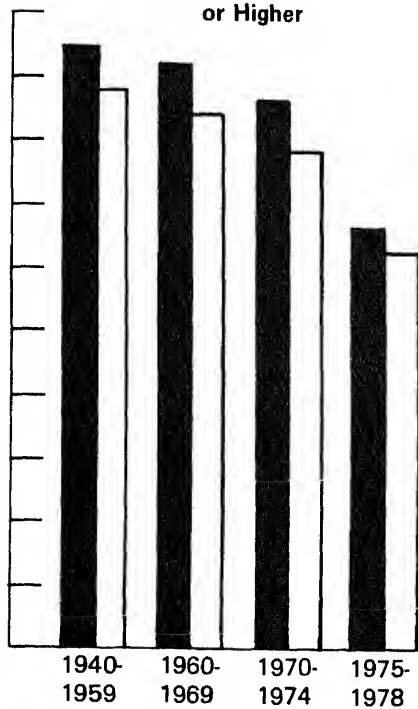
		1940-1959	1960-1969	1970-1974	1975-1978
			thousands of $		
All fields	Men	34.1	28.4	22.5	19.4
	Women	30.3	25.5	21.3	18.5
	% Less	11%	10%	5%	5%
		(308)	(717)	(529)	(375)
Math	Men	34.0	28.2	22.6	19.3
	Women	33.7	25.1	21.1	18.9
	% Less	<1%	11%	7%	2%
		(30)	(83)	(45)	(46)
Physics	Men	36.0	27.4	22.6	22.7
	Women	31.7	25.3	22.2	21.5
	% Less	12%	8%	2%	5%
		(18)	(37)	(29)	(12)
Chemistry	Men	29.8	27.3	21.8	21.5
	Women	25.6	23.6	20.8	18.2
	% Less	14%	14%	5%	15%
		(19)	(48)	(25)	(13)
Biological sciences	Men	34.0	28.5	23.2	20.5
	Women	29.4	24.0	21.0	18.4
	% Less	14%	16%	9%	10%
		(74)	(144)	(123)	(44)
Psychology	Men	37.0	29.5	22.9	19.1
	Women	34.2	26.0	22.6	18.5
	% Less	8%	12%	1%	3%
		(36)	(68)	(35)	(25)
Social sciences	Men	36.0	31.1	22.2	20.1
	Women	31.3	28.4	22.6	19.2
	% Less	13%	9%	- 2%	4%
		(46)	(106)	(64)	(57)
Languages & literature	Men	30.3	25.8	20.9	17.4
	Women	27.2	25.3	19.4	16.6
	% Less	10%	2%	7%	5%
		(34)	(93)	(79)	(64)

VALIDITY AND RELIABILITY OF RESULTS

e validity of the results presented in this study is sensitive
ral sources of possible bias in the selection of individuals to
ared as well as to sampling variability. The first difficulty
only about 66 percent of the total number of Ph.D.s over the
studied responded to the survey questionnaire out of those who
npled. A study by Harmon[1] of the response rate by sex and
for the 197 and 1977 surveys shows (see Table .1) that women
ained the Ph.D. in 1940-1949 have an active response rate that
10 percent lower than the rate for men. However, for the
es after 1950, the active response rate jumps up to over 80
with women only 2 percent lower than men. The difference in
centage who never responded is about one percent. The
nce in the percentage deceased is less than one percent, with
eing higher in each instance. The largest differences occur
percentage retired which is 11 percent greater for women in
0-1944 cohort, 6 percent greater in the 1945-1949 cohort, but
e percent more for those who obtained the Ph.D. from 1950 to
Nevertheless, there is evidence suggesting that those who do
pond are more likely to be unemployed and not seeking employ-
employed at a lower salary, and thus inhibited from replying.[2]
, part of the nonresponse is due to failure to locate the
ual which would not occur if one were active in the profession.
ication thus is that lack of response to the questionnaire
es a bias towards underestimating the salary decrement for
ut this bias will be small for the cohorts beyond 1950.

other possible source of bias is the strict matching of persons
d for inclusion in the matched triad or the matched pair. It
that only certain categories of individuals can be matched.

corresponding frequency in a completely unmatched group shows a
remarkable agreement (see Table 8.2). We can hope that the lac
bias extends to career outcomes also.

The study was designed with matched triads so as to have t
possibility of investigating the sampling variability built int
survey. For each woman in the triad, there are two matched men
that two comparisons can be made. The difference between the c
son with the first male and the comparison with the second male
provides a direct measure of the sampling variability. Thus, t
precision or reliability of the results can be estimated direct
The comparisons have not been completed for two reasons: first
number of matched triads is not large because of the many restr
imposed to force a tight match; secondly the number of matched
is much larger (using the better match if two are possible).
to have larger sample sizes, much of this study is performed w
matched pairs. The computations could be repeated with the wor
the triad compared to each male separately. A sample comparis
given in Figure 8.1 which shows median 1979 annual salaries of
of the matched triads in academe, by field and cohort. The co
are very consistent for the two comparisons as well as for fie
cohort. Women systematically receive lower salaries than the
corresponding matched men (the only exception being the latest
in physics, where the number of women doctorates is small).

Ph.D. cohort	Sex	Total (N)	Deceased (%)	Never resp. (%)	Retired (%)	Active resp. (%)
1940-44	Men	8,745*	14.2	13.5	17.7	54.5
	Women	779	13.5	11.8	29.1	45.6
	Both	9,524	14.1	13.4	18.7	53.8
1945-49	Men	9,176	9.7	15.2	8.3	66.8
	Women	953	11.9	17.4	13.9	56.9
	Both	10,129	9.9	15.4	8.8	65.9
1950-72	Men	195,877	1.8	14.8	0.7	82.7
	Women	18,622	2.3	15.6	1.6	80.5
	Both	214,499	1.9	14.8	0.8	82.5

*Numbers shown in the table are weighted n's.

SOURCE: Lindsey R. Harmon, Career Patterns of Doctoral Scientists and Engineers, 1973-1977, National Research Council, 1979, p. 4.

humanists

	Matched group	Unmatched (Weighted
1940-1959 female Ph.D.s		
% married+	44.2	46.
% in labor force	74.3	68.
1960-1969 female Ph.D.s		
% married+	53.6	58.
% in labor force	94.2	92.
1970-1974 female Ph.D.s		
% married+	61.9	60.
% in labor force	93.9	93.
1975-1978 female Ph.D.s		
% married+	54.2	58.
% in labor force	95.3	94.
1940-1978 female Ph.D.s, total		
% of academics in research univ. I	23.0	26.

*The percent married is based on women in Math, Physics, Chemis
Biosciences, Psychology, Social Sciences, Languages & Literatu
and Other Humanities.

+Based on total rather than total reports.

SALARY ($1,000)

Mathematics
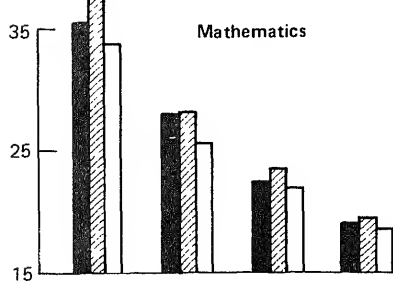
Physics
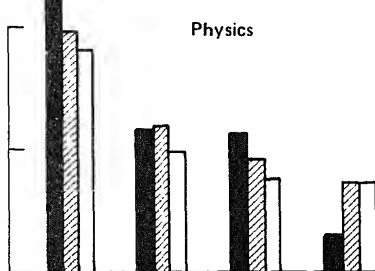
Chemistry
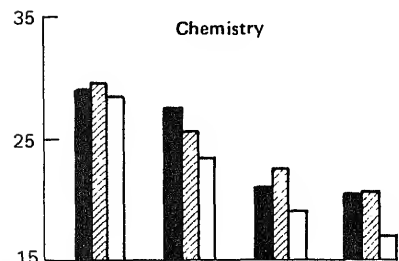
Biosciences
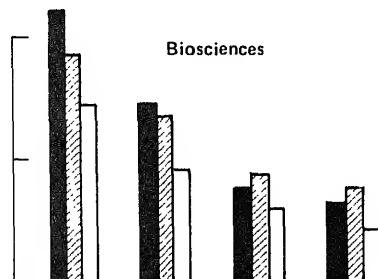
Psychology
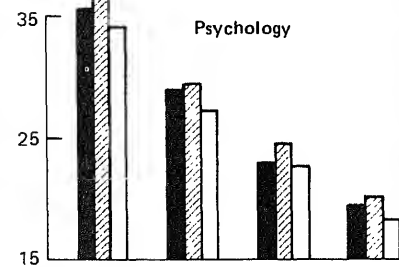
Social Sciences
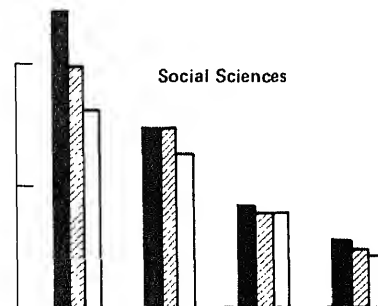
Male 1   Male 2   Female

Languages and Literature
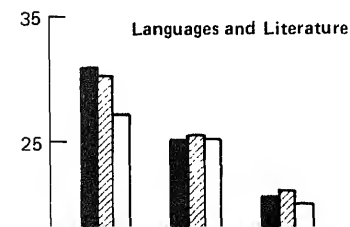
Other Humanities
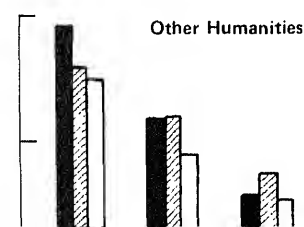
SELECTED BIBLIOGRAPHY OF STUDIES
CONCERNING WOMEN IN ACADEME

Astin, Helen S., "Factors Affecting Women's Scholarly Productiv
    chapter in *Women in Higher Education: Essays in Honor of
    Rosemary Park,* Praeger, New York, 1978.

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    Educational Record, Spring, 1972.

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    Women's Salaries on Your Own Campus," *AAUP Bulletin,* Autum

Cole, Jonathan R., *Fair Science: Women in the Scientific Commu
    Free Press, New York, 1979.

Centra, John A., *Women, Men, and the Doctorate,* Educational Tes
    Service, Princeton, New Jersey, 1974.

Ferber, Marianne, "Economic Status of Women Faculty--Reappraisa
    Journal of Human Resources, Vol. 13, No. 3, 1978.

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    Industrial and Labor Relations Review, Vol. 31, No. 2, 197

Ferber, Marianne and Walter McMahon, "Women's Expected Earnings
    Their Investment in Higher Education," *Journal of Human Re
    Summer 1979.

Marwell, Gerald, R. Rosenfeld, and S. Spilerman, "Geographic Co
    on Women's Careers in Academia," *Science,* 9/21/79.

Reagan, Barbara, "Two Supply Curves for Economists? Implication
    Mobility and Career Attachment of Women," *American Economi
    Vol. 65, No. 2, 1975.

APPENDICES

stionnaire for the 1979 Survey of Doctorate Recipients

teria used for selecting matched triads of men and women Ph.D.s

If your name
enter correct
Code

If there is an alternate address through which you can always be reached, please provide It on the line below.

C/O	Number Street	City	St.

Please check the pre-printed information in questions 1 - 6 to be certain that it is correct and cor

1. Date of Birth Mo. Day Year (10-14)	2. State or Foreign Country of Birth (15-16)	3. Citizenship

3. Citizenship: 0 ☐ U.S.A. 1 ☐ Non-U.S.A., specify country _____ (17)

5 What is your racial background?

0 ☐ American Indian or Alaskan Native 2 ☐ Black

1 ☐ Asian or Pacific Islander 3 ☐ White

(21)

5a. Is your ethnic heritage Hispanic?

0 ☐ Yes

1 ☐ No

(22)

6. List in the table below all collegiate and graduate degrees, excluding honorary degrees, that have been awarded to you. Plea
tion, including the number and name of the specialty, from the Degree and Employment Specialties List on page 4, to be c

Type of Degree	Granted Mo. Yr.	Major Field (Use Specialties List) Name Number	Institution Name
Bachelor's			
Master's			
Doctorate			
Other, specify			

7. What is your marital status?   1 ☐ Married   2 ☐ Not married (including widowed, divorced)   (10)

a. Do you have any children under 7 years of age?   ☐ Yes   ☐ No

b. Do you have any children between 7 and 18 years of age?   ☐ Yes   ☐ No   (11)

categories 4, 5, or 6 in Question #10, you have completed the questionnaire. Please return this form in the enclosed envelope.

mployment Specialties List on page 4 select and enter both the number and title of the employment specialty most closely related to nent or postdoctoral appointment during the week of FEBRUARY 11, 1979. Write in your specialty if it is not on the list.

Title of Employment Specialty	(24-26)

ll-time during the week of FEBRUARY 11, 1979 in than your field of Ph.D., what was the MOST im- g in that position?

⬜ Enter number
from below (27)

utside Ph D field
tion in Ph D field

d not available

13. Please give the name of your principal employer (organization, com- pany, postdoctoral institution, etc. or, if self employed, write "self") and actual place of employment during the week of FEBRUARY 11, 1979.

Name of Employer			(28-33)
Number	Street		
City	State	ZIP Code	(34-38)

est describes the type of organization of your principal employment OR postdoctoral appointment during the week of FEBRUARY 11,

er number from below (39-40)

(including self-employed)
r college, technical institute
cluding university affiliated hospital or medical

n medical school
dary school system

l society

9. Research library or archives
10. Hospital or clinic
11. U.S. military service, active duty, or Commissioned Corps, e.g., USPHS, NOAA
12. U.S. government, civilian employee
13. State government
14. Local or other government, specify _____
15. Non-profit organization, other than those listed above
16. Other, specify _____

rofessional work time did you devote to each of the following activities during the week of FEBRUARY 11, 1979?

	%			%
gement & Administration of				
Research and development	7 _____ (53) Design		13. _____ (65) Curatorial work	
Educational programs	8 _____ (55) Teaching		14. _____ (67) Performing arts	
Other	9 _____ (57) Writing, editing		15. _____ (69) Quality control, inspection, testing	
research	10. _____ (59) Professional services to		16. _____ (71) Sales, marketing, purchasing,	
d research	individuals		estimating	
opment of equipment,	11. _____ (61) Consulting		17. _____ (73) Other, specify _____	
cts, systems, data	12. _____ (63) Production	Total = 100%		

nary and secondary work activities? (Enter number 1-17 from question #15 above) ⬜ Primary (75-76) ⬜ Secondary (77-78)

nnual salary* associated with your principal professional employment during the week of FEBRUARY 11, 1979? If you were on a post- see question #10 for definition), what was your stipend plus allowances? $_____ per year (10-12)

was for ☐ 9-10 months or ☐ 11-12 months (13)

nnual salary before deductions for income tax, social security, retirement, etc., but does not include bonuses, overtime, summer teaching, or other nal work

nnual salary* for the year ending December 31, 1978? $_____ per year. (14-16)
was for ☐ 9-10 months or ☐ 11-12 months (17)
s professional income** for the year 1978? $_____ (18-20)

ncome is all payments received for professional activities including basic salary before deductions plus bonuses, consulting fees, honoraria, royalties

4. Instructor
5. Other, specify _____

20. Was any of your work during the week of FEBRUARY 11, 1979 supported or sponsored by U.S. Government funds?

        0 ☐ Yes   1 ☐ No   2 ☐ Don't know   (26)

If YES, which federal agencies or departments were supporting the work? _____

                                (Enter the number(s) from the List of Federal Supporting Agen

21. Listed below are selected topics of critical national interest. If you devoted a proportion of your professional time which you considered these problem areas during the week of FEBRUARY 11, 1979, please give the corresponding number of the ONE on which you spent

☐ Enter number from below   (61-62)

1. Energy or fuel
2. Health
3. Defense
4. Environ. protection, pollution control
5. Education (other than teaching)

6. Space
7. Crime prevention and control
8. Food and other agricultural products
9. Natural resources, other than fuel or food
10. Community development and services

11. Housing (planning, design, cor
12. Transportation, communication
13. Cultural life
14. Other area, specify _____

s. Please enter your BEST estimate of the percent of your professional time during the week of February 11, 1979 that was devo national interest.

☐ Enter number from below   (63)

1. 100 percent
2. 75 to 99 percent

3. 50 to 74 percent
4. 25 to 49 percent

5. 24 percent or less

| If you selected energy or fuel (category #1) in question #21, please provide the information requested in Items #22, #23 a |

---

22. From the list below, give the corresponding number of the ONE energy source that involved the LARGEST proportion of your energy-re week of FEBRUARY 11, 1979.   ☐ Enter number from below   (64)

1. Coal and coal products
2. Petroleum (including oil shale and tar sands) or natural gas
3. Fission
4. Fusion
5. Hydroenergy

6. Direct solar (including space and water heating, therm
7. Indirect solar (winds, tides, biomass, etc.)
8. Geothermal
9. Other, specify _____

23. Please read the following list of energy-related activities and give the corresponding number(s) from the list below of the activity(ie engaged during the week of FEBRUARY 11, 1979. Enter number(s) from below _____ (65-78)

1. Exploration
2. Extraction (gas, oil, mining)
3. Manufacture of energy-related components or products
4. Fuel processing (including refining and enriching)
5. Electric power generation
6. Transportation, transmission, distribution of fuel or energy
7. Energy storage

8. Energy utilization, management
9. Fuel reprocessing or disposal
10. Energy conservation
11. Environmental impact (health, economic, etc.)
12. Education, training
13. Research and development
14. Other, specify_____

24. Please enter the number 1-14 from item #23 that BEST describes the activity in which you spent MOST of your energy-related time. ☐

Thank you for completing this questionnaire. Please return the completed form in the enclosed envelope to the Commission on
JH638, National Research Council, 2101 Constitution Avenue, Washington, D.C. 20418.

305 - Geochemistry
310 - Stratigraphy, Sedimentation
320 - Paleontology
330 - Structural Geology
341 - Geophysics (Solid Earth)
350 - Geomorph & Glacial Geology
391 - Applied Geol., Geol Engr & Econ Geol
395 - Fuel Tech & Petrol Engr. (see also 479)
360 - Hydrology & Water Resources
370 - Oceanography
397 - Marine Sciences, Other*
381 - Atmospheric Physics & Chemistry
382 - Atmospheric Dynamics
383 - Atmospheric Sciences, Other*
388 - Environmental Sciences, General (see also 480, 528)
389 - Environmental Sciences, Other*
398 - Earth Sciences, General
399 - Earth Sciences, Other*

ENGINEERING

400 - Aeronautical & Astronautical
410 - Agricultural
415 - Biomedical
420 - Civil
430 - Chemical
435 - Ceramic
437 - Computer
440 - Electrical
445 - Electronics
450 - Industrial & Manufacturing
455 - Nuclear
460 - Engineering Mechanics
465 - Engineering Physics
470 - Mechanical
475 - Metallurgy & Phys. Met. Engr.
476 - Systems Design & Systems Science (see also 072, 073, 074)
478 - Operations Research (see also 082)
479 - Fuel Technology & Petrol. Engr. (see also 395)
480 - Sanitary & Environmental
486 - Mining
497 - Materials Science Engr
498 - Engineering, General
499 - Engineering, Other*

AGRICULTURAL SCIENCES

500 - Agronomy
501 - Agricultural Economics
502 - Animal Husbandry
503 - Food Science & Technology (see also 573)
504 - Fish & Wildlife
505 - Forestry
506 - Horticulture
507 - Soils & Soil Science
510 - Animal Science & Animal Nutrition
511 - Phytopathology
518 - Agriculture, General
519 - Agriculture, Other*

523 - Veterinary Medicine
524 - Hospital Administration
526 - Nursing
527 - Parasitology
528 - Environmental Health
534 - Pathology
536 - Pharmacology
537 - Pharmacy
538 - Medical Sciences, General
539 - Medical Sciences, Other*

BIOLOGICAL SCIENCES

540 - Biochemistry (see also 280)
542 - Biophysics
543 - Biomathematics
544 - Biometrics and Biostatistics (see also 055, 670, 725, 727)
545 - Anatomy
546 - Cytology
547 - Embryology
548 - Immunology
550 - Botany
560 - Ecology
562 - Hydrobiology
564 - Microbiology & Bacteriology
566 - Physiology, Animal
567 - Physiology, Plant
569 - Zoology
570 - Genetics
571 - Entomology
572 - Molecular Biology
573 - Food Science & Technology (see also 503)
574 - Behavior/Ethology
576 - Nutrition & Dietetics
578 - Biological Sciences, General
579 - Biological Sciences, Other*

PSYCHOLOGY

600 - Clinical
610 - Counseling & Guidance
620 - Developmental & Gerontological
630 - Educational
635 - School Psychology
641 - Experimental
642 - Comparative
643 - Physiological
650 - Industrial & Personnel
660 - Personality
670 - Psychometrics (see also 055, 544, 725, 727)
680 - Social
698 - Psychology, General
699 - Psychology, Other*

708 - Communications*
709 - Linguistics
710 - Sociology
720 - Economics (see also 501)
725 - Econometrics (see also 055, 544, 670, 727)
727 - Social Statistics (see also 055, 544, 670, 725)
740 - Geography
745 - Area Studies*
751 - Political Science
752 - Public Administration
755 - International Relations
770 - Urban & Regional Planning
775 - History & Philosophy of Science
798 - Social Sciences, General
799 - Social Sciences, Other*

HUMANITIES

802 - History & Criticism of Art
804 - History, American
805 - History, European
806 - History, Other*
808 - American Studies
809 - Theater & Theater Criticism
830 - Music
831 - Speech as a Dramatic Art (see also 885)
833 - Religion (see also 881)
834 - Philosophy
838 - Comparative Literature
891 - Library & Archival Sciences
878 - Humanities, General
879 - Humanities, Other*

LANGUAGES & LITERATURE

811 - American
812 - English
821 - German
822 - Russian
823 - French
824 - Spanish & Portuguese
826 - Italian
827 - Classical*
829 - Other Languages*

EDUCATION & OTHER PROFESSIONAL FIELDS

801 - Art, Applied
881 - Theology (see also 833)
882 - Business Administration
883 - Home Economics
884 - Journalism
885 - Speech & Hearing Sciences (see also 831)
886 - Law, Jurisprudence
887 - Social Work
897 - Professional Field, Other*
899 - Other Fields*

938 - Education (other than teaching in a field listed above)

*Identify the specific field in the space on the questionnaire

LIST OF FEDERAL SUPPORTING AGENCIES (For use with #20)

Development   1 - Department o Commerce   18 - Department of Housing and Urban

CRITERIA USED FOR SELECTING
MATCHED TRIADS OF MEN AND WOMEN PH.D.S

GENERAL MATCHING CRITERIA

a. Categories for matching by Roose-Andersen rating of Ph.D.
    department
    (1)   4.0 - 5.0
    (2)   3.0 - 3.9
    (3)   2.5 - 2.9
    (4)   2.0 - 2.4
    (5)   1.0 - 1.9

b. Broad field of doctorate
    (01) Math
    (02) Computer sciences
    (03) Physics
    (04) Chemistry
    (05) Earth sciences
    (06) Engineering
    (07) Agriculture
    (08) Medical
    (09) Biological
    (10) Psychology
    (11) Social sciences
    (12) Languages/lit
    (13) Other humanities

c. Categories for matching by race (cases with unknown race sh
    not be matched)
    (1)   White
    (2)   Asian
    (3)   Black
    (4)   Other

d. Allowable difference in year of doctorate:
        1 70 - 1978   ± 1 year

Characteristics of the females the matched head or pair	Matched Triads general matching criteria*	Number of "A" Matched Pairs by Cohort				Matched Triads (A) + same empl. sector, experience	Matched Pairs in Academe by Cohort				No. of B oken "B" Triads in Rank Regression 1958-1978 cohort	
		1940-1959	1960-1969	1970-1974	1975-1978		1940-1959	1960-1969	1970-1974	1975-1978	Women	Men
Total	5,164					3,083	406	893	711	674	373	833
							(all years = 2,634)					
Year of doctorate												
1940-1949	1,119											
1950-1959	1,512											
1960-1969	1,283											
1970-1978	1,245											
Field of doctorate++												
Mathematics	390	82	136	95	77	244	42	101	56	54		
Physics	363	78	97	94	94	206	24	50	47	38		195
Chemistry	541	134	162	124	121	329	30	65	40	45	94	
Earth Sciences	161	31	37	41	52	67	6	10	19	19		
Engineering	128	10	30	36	52	61	4	11	10	14		
Medical Sciences	183	22	52	51	58	56	7	21	22	31		332
Biological Sciences	1,190	256	347	291	296	799	93	183	172	178	126	
Psychology	531	151	155	121	104	337	48	81	49	38	100	162
Social Sciences	547	141	171	128	107	309	58	128	77	63		
Languages/Lit.	482	84	135	137	126	320	46	110	100	85	53	144
Other Humanities	648	130	190	170	158	356	48	133	119	104		
Employment sector												
Academe	n/a					2,138						
Business/industry	"					332						
Federal govt.	"					85						
Other employer/not employed	"					528						

* As described on page 94.

Regression analyses of faculty rank included 1958-1978 Ph.D.s who were faculty at Research Universities I (a Ca[r]-tion which includes 51 institutions), and for whom the appropriate demographic and employment information was a[vailable]. Regression analyses of faculty salaries were further restricted to those who were full-time employed and reporte[d]

++ The fields of computer sciences and agricultural sciences, for which Roose-Andersen ratings of Ph.D. department[s] [were unavail]able, were excluded.